Dissertation on

"CLINICAL PROFILE AND OUTCOME OF PATIENTS WITH NEUROTOXIC SNAKE BITE"

Submitted in partial fulfillment for the Degree of

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THE TAMIL NADU DR. MGR MEDICAL UNIVERSITY

CHENNAI – 600003

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CERTIFICATE

This is to certify that the dissertation entitled "**CLINICAL PROFILE AND OUTCOME OF PATIENTS WITH NEUROTOXIC SNAKE BITE"** is a bonafide original work done by **Dr. M. SUDHA**, in partial fulfillment of the requirements for M.D. GENERAL MEDICINE BRANCH – I examination of the Tamilnadu Dr. M.G.R Medical University to be held in April 2015, under my guidance and supervision in 2014

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I hereby solemnly declare that the dissertation entitled "**CLINICAL PROFILE AND OUTCOME OF PATIENTS WITH NEUROTOXIC SNAKE BITE"** is done by me at Institute of Internal Medicine, Madras Medical College & Rajiv Gandhi Government General Hospital, Chennai during 2014 under the guidance and supervision of **Prof. S.G. SIVACHIDAMBARAM M.D.,** This dissertation is submitted to The Tamilnadu Dr. M.G.R Medical University, Chennai towards the partial fulfillment of requirement for the award of M.D. Degree in General Medicine (Branch I)

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CONTENTS

ABBREVIATIONS

ASV	-	Anti- Snake Venom
CK	-	Creatine Kinase
ECG	-	Electrocardiogram
IM	-	Intramuscular
IV	-	Intravenous
SC	-	Subcutaneous
LFT	-	Liver function test
DIC	-	Disseminated Intravascular coagulation
SBC	-	Single breath count
AV block	-	Atrio ventricular block
WBCT	-	Whole Blood Clotting Time
VAP	-	Ventilator associated pneumonia

“CLINICAL PROFILE AND OUTCOME OF PATIENTS WITH NEUROTOXIC SNAKE BITE”

ABSTRACT:

INTRODUCTION:

Snake bite is the common medical emergency in India which we are encountering in our day to day practice. Snake bite is the most common problem in rural area and peri-urban areas. It is an occupational hazard among agricultural workers. Worldwide, India is having the highest number of mortality due to snake bite. Most of the deaths in the snake bite are due to time delay in reaching the hospital. The outcome of snake bite mainly depends on time delay in reaching the hospital and ASV administration. Among those who presenting to the hospital lately there is increased incidence of respiratory failure, prolonged hospital stay.

AIMS & OBJECTIVES:

- To study the clinical profile of patients with neurotoxic snake bite.
- To study the outcome of neurotoxic manifestations of snake bite in terms of recovery or death.
- To correlate the outcome of neurotoxic snake bite with the following factors: Time delay, Respiratory failure, Amount of ASV needed, Type of snake, Need for ventilatory support, Ventilator associated pneumonia.

MATERIALS AND METHODS:

Patients admitted with of history of snake bite-selected for clinical study as per inclusion/exclusion criteria are subjected to detailed history taking and clinical examination after obtaining informed consent. Type of snake, site and number of bite, occupation, time delay in reaching the hospital, amount of anti snake venom needed, neurotoxic manifestations are recorded in detail. Routine blood investigations like complete hemogram, renal function tests, serum electrolytes, serum creatine kinase were done for all patients included in the study.

Respiratory failure and need for mechanical ventilation among the study group was noted. Clinical progression over the day is observed in terms of deterioration of illness, recovery, death.

RESULTS:

In our study, we observed that majority of the victims were in the age group between 41-60 years. Most of them were males and from rural areas. Cobra envenomation was more common than other snakes. The most common neurological manifestation observed was ptosis, followed external ophthalmoplegia and neck muscle weakness. Prolonged ventilatory support had increased risk for VAP. Respiratory failure, time delay in reaching the hospital premises had significant effect on the outcome of the individual. Early treatment with ASV reduces the mortality.

CONCLUSION:

Snake bite is a preventable health hazard. Health education and awareness among the people reduces the mortality. There should be a National standardized protocol for managing snake bite. It should be strictly followed even in the primary health centres to reduce the mortality and also to prevent the time delay in accessing the tertiary care centre.

KEY WORDS: Anti snake venom, ptosis, ventilator associated pneumonia.

INTRODUCTION

Snake bite is the common medical emergency in India which we are encountering in our day to day practice. Snake bite is the most common problem in rural area and peri-urban areas. Snake bite is preventable health hazard.

Worldwide, India is having the highest number of mortality due to snake bite. According to WHO the total number of bites is estimated to be around 83,000 cases among these there were about 11,000 deaths. Most of the deaths in the snake bite are due to time delay in reaching the hospital.

There are about 236 snakes in number only 52 snakes are poisonous in India. Snake bite is an occupational hazard in farmers,plantation workers and outdoor workers. The large number of snake bite occur while the people walking at night or walking in bare foot or in early morning along road side.

Snake bite can be prevented by educating the people working in agricultural fields: should not walk in bare-foot and to wear protective gloves, by avoiding the harmful practices such as tourniquet application, herbal remedies, cutting and sucking the bitten area, quackery. These harmful practices are ineffective and dangerous too.

The outcome of snake bite mainly depends on time delay in reaching the hospital and ASV administration. Among those who presenting to the hospital lately there is increased incidence of respiratory failure, prolonged hospital stay and renal failure.

Current intensive work is done in the pathological, toxicological, pharmacological and immunological aspects of snake bite which led to the production of polyvalent and monovalent antisnake venom.

National snake bite protocol is presented as a solution based approach. It emphasises the need for behavioural change in community to educate the people about the occupational risks and reduction. It emphasised that the patient with snake bite with envenomation when treated with ASV has better outcome.

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REVIEW OF LITERATURE

REVIEW OF LITERATURE

HISTORY:

Snakes are the worship of Dravidian people and object of reverence since time immemorial. Since snakes have the fascinating appearance and it has the ability to cause death had created the interest for biologists and toxicologists all over the world.

The word snake and serpent are interchangeable. The word Serpent is derived from Latin “serpens” meaning creeping. In India Sushrutha suggested the treatment for snake bite by ligating the area above the snake bite and cauterizing the wound with hot iron rod.6

Nicande (204-135 BC) Greek poet wrote a book named ‘Theriaca’, the book which contains the presentation and treatment of poisoning from animal toxins.9

Mithridates (132-63 BC) king of pontus, prepared antidote in roman pharmacy named ‘Mithridatum’ which consists of about 36 ingredients. Andromachus (AD 37-68) added some ingredients to Mithridatum by adding squills and opium to counteract all poisons and bites of venomous animals.13

Nobel and Schmidt in 1937 proved that the pits on vipers have thermoreceptors. Essex described symptoms of various snake bites in 1945.(21) Yang was the first person to describe cobra toxin in 1968.(22). Weiss used heparin to treat bites by Echis carinatus in 1973.(23)

EPIDEMIOLOGY:

WORLD:

Venomous snake bite is the most important global cause of human injury from venomous and poisonous animals of all types.(17). Snake bite envenomation is serious health problem in rural areas of tropical and sub-tropical countries like Asia, Oceania, Africa and Latin America. About 4,21,000 snake bite and 20000 deaths occur worldwide due to snake bite throughout the world every year(20). The most fundamental problem in Asia- pacific region is that the snake bite treatment usually lies in the hands of traditional or herbal practitioners, so majority of the snake bite victims die before reaching the hospital.

INDIA:

Snake bite mortality rate in India is about 3.35. About 15,000 death occur due to snake bite in India annually according to Swaroop and Grab(1954). Majority of snake bite victims are usually in the age group of 11-50 years. Males are commonly affected than the females.

Snake bite is most commonly seen in rural,outdoor areas and most common occupation hazard among the farmers and plantation workers. Most commonly the snake bite occur during midnight or in the early morning. Most of the cases occur during the month of May and September.

According to Sawai et al(1974) the most common site of bite being the lower extremities(68%) followed by upper extremity, among the lower extremity feet is the common site(41%). Death due to snake bite is common in children and young people this is in relation to the body surface area because in children large venom is injected into the body surface area.

According to Sawai et al Cobra is responsible for the most of the death and second most common is krait.(27). Mortality rate is low with vipers. Snakes responsible for bite were only identified in about 6% of the hospitalised persons.

SNAKES:

Snakes belong to the

Class- reptiles

Order- Squamata

Sub-order- Serpents(Ophidia)

Snakes are classified on the basis of dentition, sensory organs, arrangement of scales, osteology, on basis of immunological study of their venom and serum protein. Snakes are mainly carnivorous mainly feeds on the animals. Snake are divided into three parts- head, elongated body and tail. Of these the body of the snake is fully covered with scales, scales are usually shed during the moulting periods periodically. Snakes are usually lethargic and blind during the moulting period.

Snakes will have only a skull and extended spinal column without any appendanges for locomotion, it's the linear most of all the vertebrates. Snakes usually use four patterns of movement:

- ***Lateral undulation***
- ***Concertina movement***
- ***Rectilinear movement***
- ***Side winding***

Usually at rest their bodies remain in the coiled state, they never remain stretched out. They usually locate their food by their sense of smell, sense of vision and thermo sensitivity. The body of the snakes are very much sensitive to vibration. They smell its food by means of its forked tongue which enables it to collect the airborne particles and later it passes the particles to the Jacobson's organ. Some of the snakes have infrared sensitive receptors around the nostrils or eyes which helps in seeing the radiated heat that emitted from the prey and by means of that they easily locate the prey.

Snakes does not have the effect of creating and maintaining the body heat, this is because they are more common in tropical and warm desert areas, they are otherwise called as cold blooded animals. In tropical countries due to high temperature they are throughout the year both during day and night.

Snakes are classified according to their toxicity as poisonous and non-poisonous.

There are about five families of poisonous snakes (Biggam and Wright)

- Colubridae (tree snakes)
- Elapidae (cobra and krait)
- Hydrophidae (poisonous sea snakes)
- Viperidae (Russell's viper) and
- Crotalidae (pit viper)

Among these elapidae- cobra and krait is the most common poisonous snakes inhabiting India. Among these Crotalidae and colubdridae are not seen in India.

The ***"Big 4s"*** that had been a big threat to India are Indian krait(Bungarus caerulens), the common cobra (Naja naja), saw scaled viper (Echis carinatus) and russell's viper(Viper russelii).

The most common non –poisonous snakes are natux piscator,rat snake,common whip snake,cat snake,wolf snake and Indian python.

WHO classification of medically significant snakes:

As against the list of "Big 4s", WHO categorised the snakes of medical importance into three main classes in 1981 according to the severity associated with snake bite.

Class I: Commonly cause death or serious disability

Eg: cobra, saw scaled viper and Russell's viper.

Class II: Uncommonly causes bites but are recorded to cause serious effect(death or local necrosis)

Eg: common krait, hump nosed pit viper, king cobra

Class III: commonly cause bites but serious effects are very uncommon.

Eg: Lipped pit viper.

The most common snakes which we encountered in our day to day practice and some of the characteristics of the snakes are listed below:

Naja naja(Cobra):

It has an average length of about 1-2 meters and it is active during both day and night. It usually does not bite a non-moving person. Colour varies from dark brown or black to yellowish white, Head is usually oblong shape and has truncated frontal shield, Head has a well defined spectacle mark and the hood has a dark spot on either side and two or more broad black cross bands present below the hood, Small fangs with a gutter is present, Lethal dose is about 120 mg, Cobras are not usually aggressive and usually escape when encountered in wild, They usually bite the humans when they accidentally step on it or under extreme provocation.

Figure 1- King Cobra

Common Krait:

It has an average length of about 1-1.75 meters and it is usually active during night. Fangs are usually short. They enter the human dwelling frequently. Lethal dose is about 2-3 mg. Colour varies from bluish black or bluish grey. There is increased tendency for nocturnal bites.

Saw scaled viper:

It is the smallest among the four snakes and has an average length of about 30-80 cm. it is usually greyish brown in colour with lancet at the head. Lethal dose is about 5 mg. it is about 5 times more toxic than cobra and 16 times more toxic than Russell viper. It produces violent rustling sound, very nervous snake and it usually strikes at slight provocation. It usually flings in air of about 30 cm to deliver the bite.

Russell viper:

It has an average length of about 1-1.85 meters. Colour varies light brown to yellowish brown. Fangs are big erectile and canaliculated. Head has 2 large black spots at the base and 'V' shaped mark with apex on the top of snout. Lethal dose is 150 mg. it is active in the evening and at night. If it gets injured it bites with great force. It produces a characteristic hissing sound which is usually heard at a distance of about 25 feet.

Figure 2- Common krait

Figure 3 – saw scaled viper

Figure 4- Russell's viper

Identification of poisonous snakes:

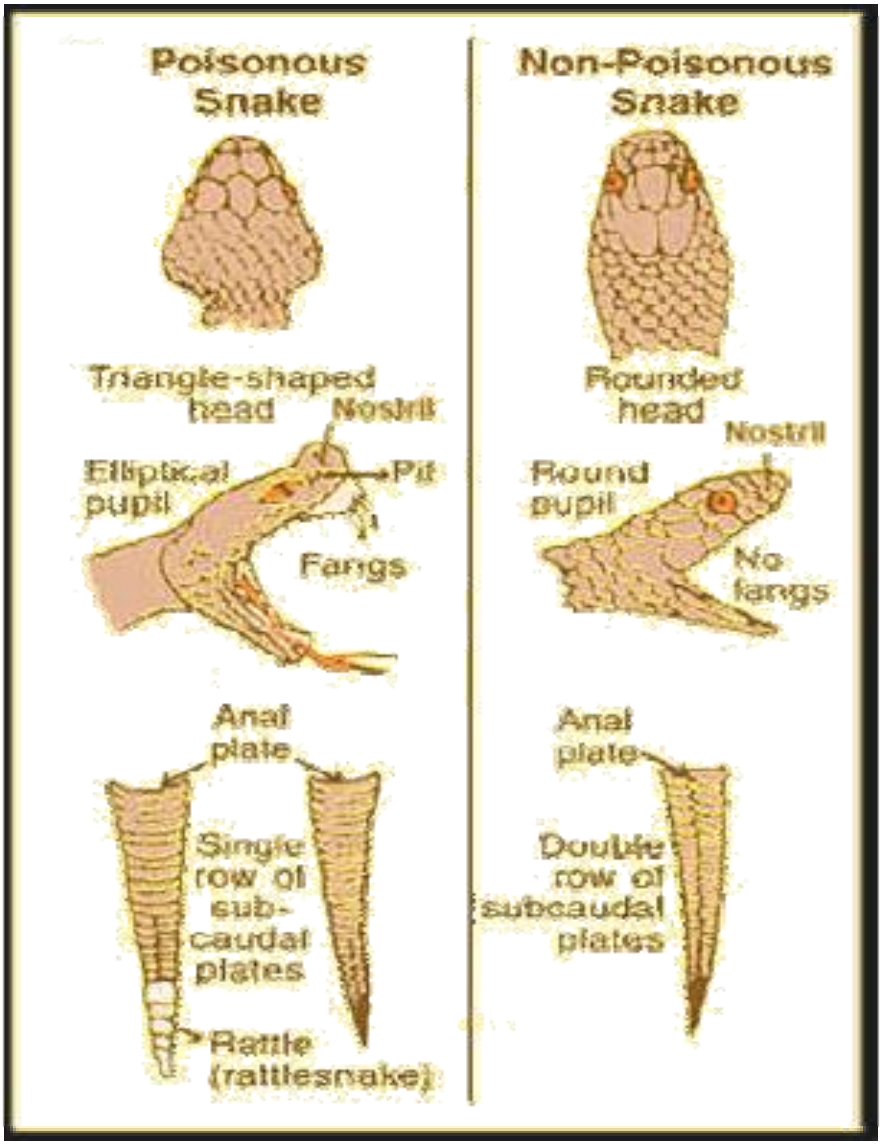
The poisonous snakes are identified by some characterstics as listed below:

- In poisonous snakes, the tail is laterally compressed.
- Pit viper is identified by means of ‘loreal pit’ which is present between the eye and nostril
- Russell’s viper- loreal pit and sub-caudals are double(15)
- Viper- scales in the dorsal side of head are small.
- Krait- upper part of head having small scales and large shield, absent loreal pit, it has a fourth infralabial shield in lower jaw
- Cobra- head has both small and large shields in dorsal aspect and third supralabial shield between the nostril and eye

Table 1-Differences between non-poisonous and poisonous snakes

Features	Non-poisonous	Poisonous
Fangs	Short and solid	Grooved and long
Teeth	Small tooth many in number	Two long fangs
Belly scales	Small scales but incomplete	Usually large scale covers the entire belly
Habits	Non-specific	Nocturnal
Head scales	Scales are large	Small in case of viper Large scales • Pit viper- loreal pit present • Krait-four infra labials and central row of scales on the back • Cobra-third labial touches the eye
Tail	No lateral compression	Laterally compressed

Figure 5- Differences between the poisonous and non-poisonous snakes



Classification of snakes based on fangs:

Fangs/ teeth helps the snakes in injecting the venom into the tissues of its prey. Spitting cobras are one type of cobra that squeezes the venom out of their fangs and ejects a fine spray which is directed towards the eyes of victim.(15)

There are four types based on their fangs. They are

- Aglyphs
- Opisthoglyphs
- Solenoglyphs
- Proteroglyphs

Aglyphs:

Fangs are absent in this type of snakes, eg: non-venomous snakes

Opisthoglyphs :

Fangs are present at the back of the mouth. Groove is present in the fang through which the venom flows. Eg: tree snakes

Solenoglyphs:

This type of snake is having the advanced biting apparatus, fangs are very long in these snakes. This venom usually act on the vascular system. When unused the biting apparatus are folded in the roof of mouth. Eg; viper and rattle snakes

Proteroglyphs:

Some of the snakes have grooves in the fangs and in others grooves are present in the sides which then unites to form a canal, which helps in effective delivery of the venom into the victim. This venom mainly acts on the nervous system.Eg; cobra

Venom apparatus and its constituents:

Venom apparatus consists of gland, duct and canal. Venom gland opens into the canal through the duct, venom canal is situated in front of the upper jaw in the fangs. Venom can be injected in either way by means of subcutaneous route or by intramuscular route. Snakes are capable of controlling the amount of venom injected during bite.

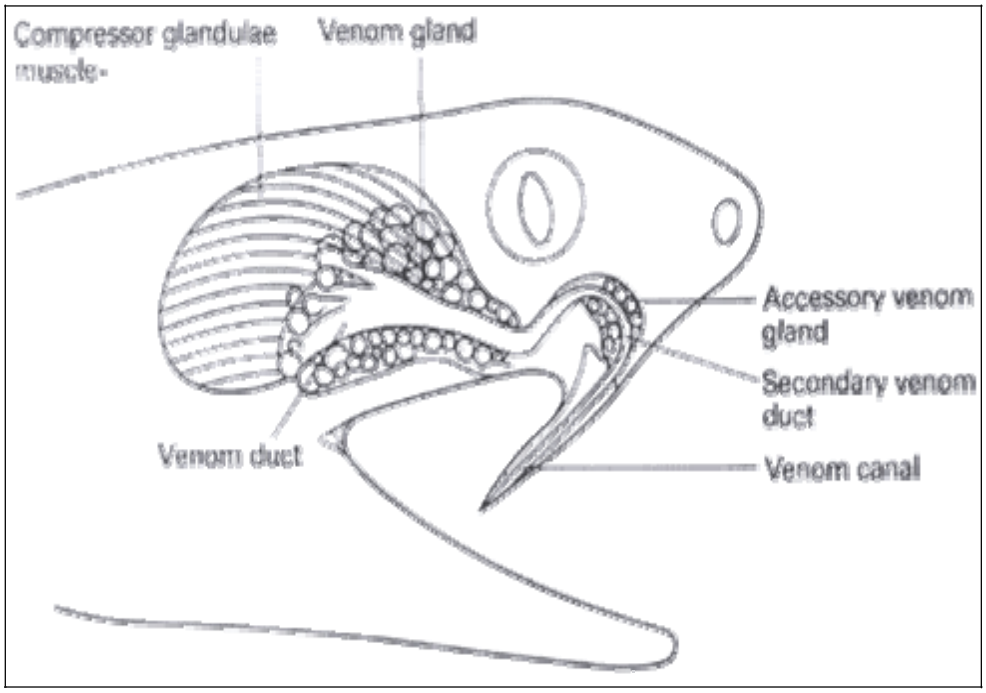


Figure 6- Venom apparatus

"Dry bites" are the bites in which the snake bites the person without injecting the venom. Reason for dry bite can be due to snake voluntarily retends the venom or when the snake bites through the clothing or when the snake bites through an unnatural angle.

Venom helps the snake in digestion and immobilisation of the prey. Snake venoms consists of many proteins(60-90).

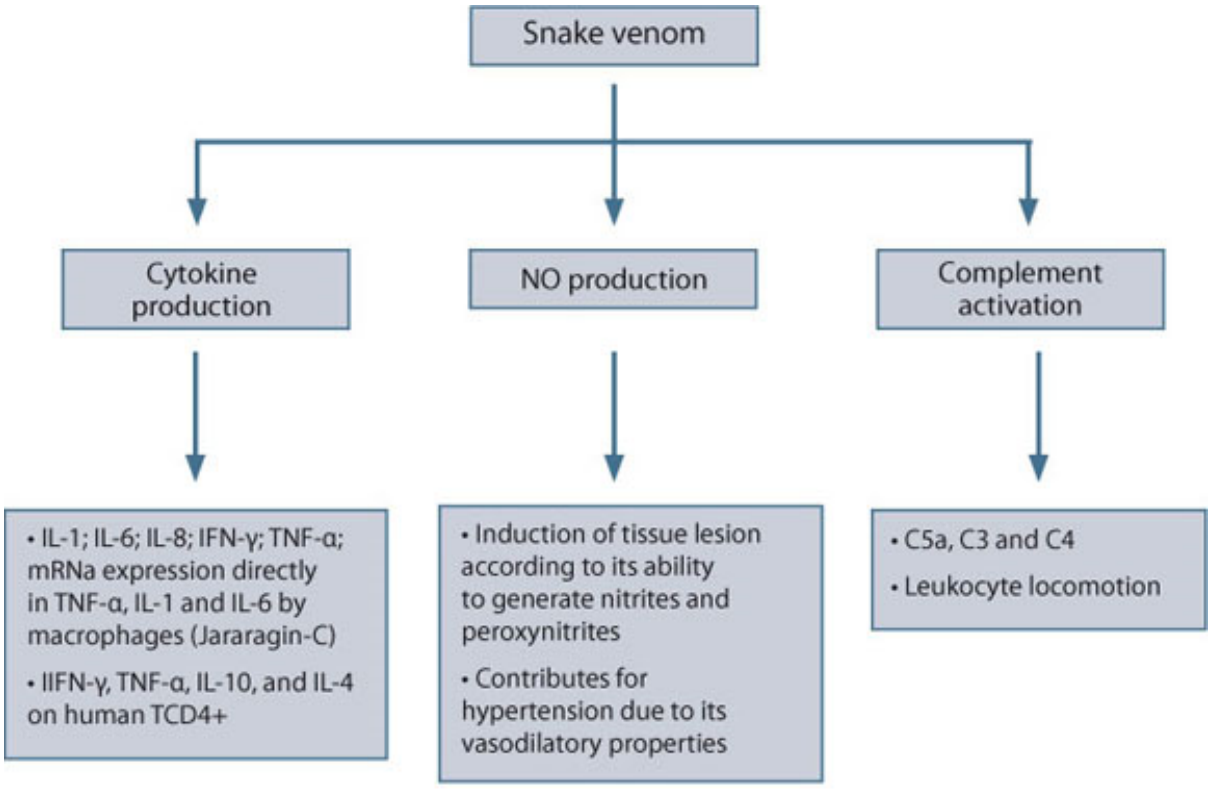


FIGURE 7- MECHANISM OF VENOM ACTION

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The components of the snake venom are

1. Enzymes
2. Non-enzymatic polypeptides
3. Non toxic proteins

ENZYMES:

- Proteinases- due to proteolytic action it causes tissue damage
- Hyaluronidase- It produces edema and swelling of the adjacent areas
- Phosphatase- causes reduction in blood pressure
- Acetylcholine esterase- has effect on neuromuscular junction and heart muscle
- Phospholipases-produces haemolysis by means of secreting lysolecithin
- Arginine esterase hydrolase- coagulant action.
- 5’ nucleotidase- hydrolyses the phosphate monoesterase, active phosphatase in the venom.

NON-ENZYMATIC POLYPEPTIDES:

Non- enzymatic peptides are responsible for the mortality, because the components of non-enzymatic peptides are

- Hemorrhagins
- Neurotoxin and
- Cardiotoxin

- **Hemorrhagins**

It exerts its effect by means of releasing histamine and serotonin which causes vasodilation and interrupting the basement membrane produces vascular damage and haemorrhage. It produces haemorrhage in heart,lungs,brain ,gastrointestinal tract and kidneys.

- **Cardiotoxin**

It acts on the cell membranes and produces effects on cardiac, smooth and skeletal muscles, neuromuscular junction thereby producing circulatory failure, muscle paralysis, cardiac asystole and respiratory failure. This is because the cardiotoxin causes irreversible depolarization of cell membrane transporters and produces cardiac asystole by releasing the calcium from the surface of the myocardium.

- **Neurotoxin:**

It acts by blocking the neuromuscular transmission in either of the two ways, by means of producing alpha and beta bungarotoxin. Alpha bungarotoxin produces effect similar to that of d-tubocurarine by means of acting on the motor end plate post-junctionally by blocking the neuromuscular junction by means of anti-depolarisation. This effect can be reversed by neostigmine.

Beta- bungarotoxin produces effect similar to that of botulinium toxin. It produces neuromuscular blockade by means of acting pre-synaptically thereby

it reduces the acetyl choline output. The blockade mainly dependant on the frequency of nerve stimulation.

Snake Venom exhibits different degree of toxicity, this is mainly dependant on the species of the snake, amount of venom injected, multiple bites, size of snake, one or two fangs penetrated the skin, mechanical efficiency of bite.

CLINICAL FEATURES OF ENVENOMATION:

Symptoms and signs of snake bite varies from person to person, which depends on the following features[41]

SPECIES: mainly depends on the symptoms of presentation

VICTIM'S SENSITIVITY: varies from person to person

AGE: younger people exhibits more toxic features compared to adults

SITE, DEPTH AND NUMBER OF BITES: More proximal the bite the rapidity of spread of venom is high. More the depth of the bite, fatality rate is more because of the fast spread of venom into the blood stream.

DEGREE AND KIND OF FIRST AID TREATMENT: Time delay in reaching the hospital and practice of some unwanted things and having treatment in the local practitioners increases the mortality of the patient.

AMOUNT OF VENOM: Biting through the clothes, bitten after recent prey will introduce only the small amount of venom.

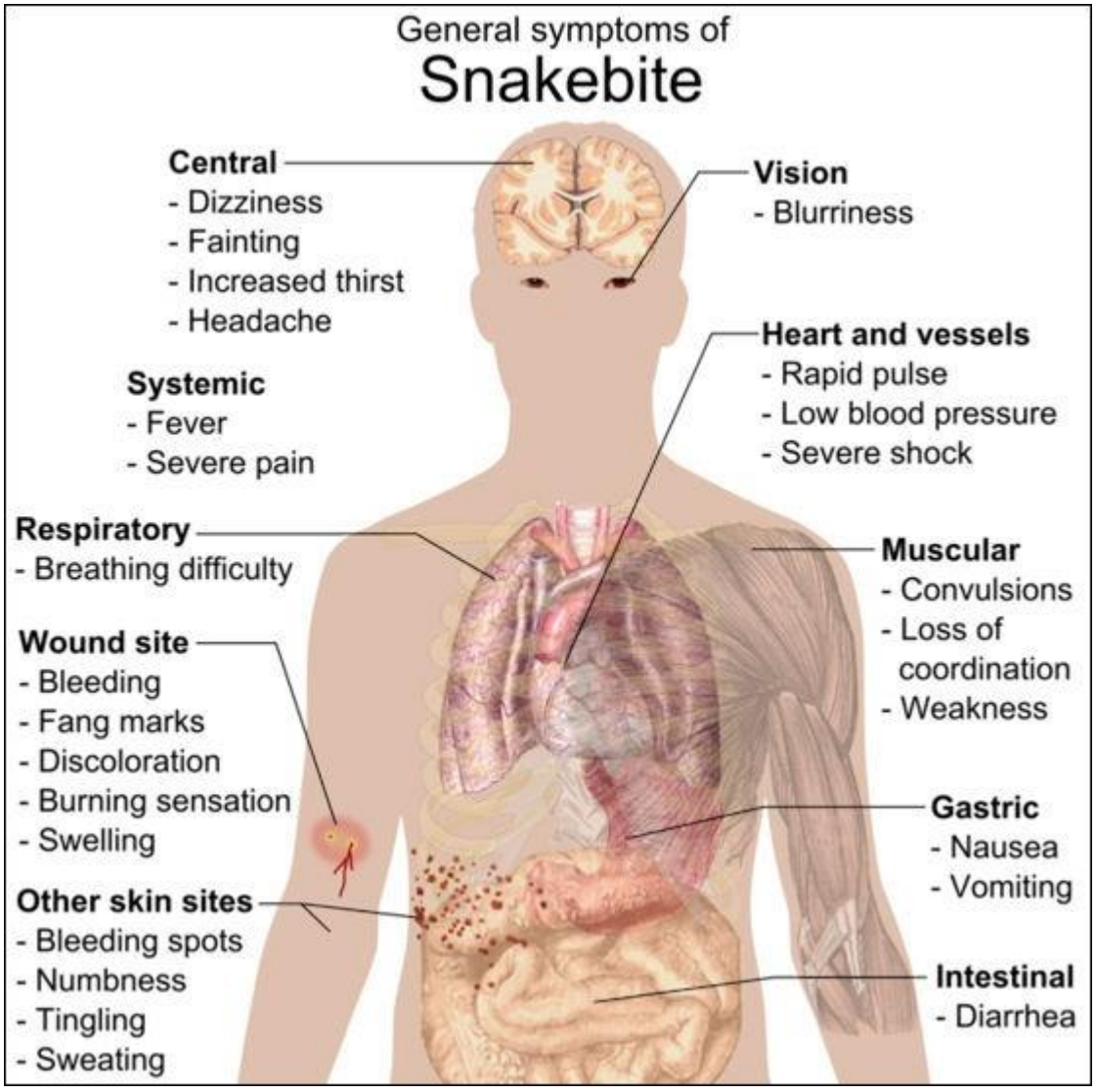


FIGURE 8: CLINICAL MANIFESTATIONS OF SNAKE BITE

Symptoms can be classified into either due to the local effects in the bitten area and systemic effects due to the toxin

LOCAL SYMPTOMS:

- ***PAIN:***

  Pain is more severe in case of viper, usually occurs within 5-10 minutes. Burning sensation at the site of bite occurs due to cobra which usually occurs within 15-30 minutes. Some non-poisonous snakes like fresh water snake and rat snake cause severe pain at the bitten area.

- ***SWELLING:***

  Swelling due to viper usually starts within minutes of bite, this is because the venom mainly act on the hemostatic system. It usually subsides within 2-3 weeks. In case of cobra swelling occurs in the period between 1-3 hours, it is usually tender. Krait and non-poisonous snakes doesn't produce local swelling.

- ***ECCHYMOSIS AND ERYTHEMA:***

  Cobra bite produces a dusky discolouration which extends in area and darkens in colour. Around third or fourth day the pigmented area is surrounded by red raised rim and when you incise the rim, it releases red material and shows the necrosis of the underlying tissue. In case of viper the discolouration is due to the extravasation of RBCs into the subcutaneous tissue, it is usually confined to the bitten area.

- ***HEMORRHAGIC BULLAE AND VESICLES:***

It is present in case of viper and cobra. Vesicles usually occur within 8-36 hours. In viper bites, if the blisters extending upto the limb denotes that large amount of venom is injected.

- ***NECROSIS:***

Wet gangrene occurs in case of cobra, it is because of the direct cytolytic effect of the venom. Necrosis occurs rapidly in case of cobra. Dry gangrene occurs in case of viper, necrosis occurs due to the ischemia. Necrosis is mainly superficial very rarely it involves the tendons,muscles,bones.

- ***BLEEDING FROM THE BITTEN AREA:***

In viper there will be Continuous oozing from the bitten area.

- ***FANG MARKS:***

Absence of fang marks doesn't exclude the snake bite. Two discrete puncture marks indicates the bite of venomous snake.

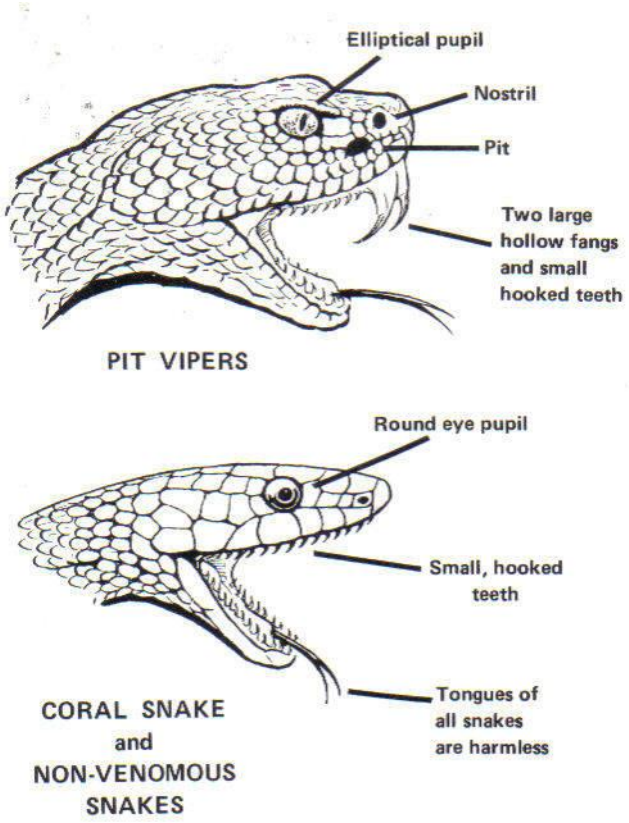


Figure 9 – FANGS OF POISONOUS AND NON POISONOUS SNAKE

Figure 10 – Local envenomation with hemorrhagic blebs

SYSTEMIC SYMPTOMS:

ELAPIDAE:

Presents with both neurotoxic and cardiotoxic manifestations.

Neurotoxic manifestations:

Earliest symptom is drowsiness or intoxication which occurs from 15 min- 3 hours. It has neuromuscular blockade action which affects the system in the orderly manner involving the muscles of eye,tongue,pharynx, chest and at last the limb muscles. The most commonest and earliest manifestation is the bilateral ptosis. Extra ocular movements are impaired producing diplopia or double vision. Due to palatal palsy the patient develops difficulty in speech, followed by dysphagia. In case of severe poisoning the patient develops respiratory paralysis which manifests as tachycardia, tachypnoea, confusion, hypotension, shallow breathing and stupor. Limb weakness occurs very late. It manifests as complete flaccid quadriplegia with intact bowel and bladder functions.

Cardiotoxic manifestations:

Symptoms usually will occur within 30 minutes due to cardiotoxin, symptoms occur very rapidly. It mainly causes cardiovascular depression which

presents as cold extremities, hypotension, sweating, tachycardia and sometimes have ECG changes seen in the ST segment and T wave. Very rarely the patients have cardiac arrthymias and cardiac asystole.

Figure 11- Patient with bilateral ptosis and external ophthalmoplegia

Cobra- spit ophthalmia:

Spitted venom from the cobra enter into the eyes of victim produces intense persistent burning sensation,pain, inflamed conjunctiva, photophobia, watering of the eyes, swelling of eyelids, blurring of vision and blindness on temporary basis. Sometimes it produces permanent vision loss by producing corneal ulceration, secondary endophthalmitis and scars in the cornea which is mainly seen in the African people not in case of Asians.

Figure 12- spit ophthalmia

VIPER:

It exhibits some non-specific symptoms which is due to the direct effect of venom by means of activating the kinin system. It occurs within few minutes of bite which includes headache, explosive diarrhoea, vomiting and abdominal pain, these symptoms resolves spontaneously within 30-60 minutes.

Haemorrhage is the classical presentation of viper envenomation. Diagnostic and earliest symptom is the uncontrolled bleeding from the bitten area with hemorrhagic bleb.

Systemic hemorrhagic manifestations include hematuria, hemoptysis, hematemesis, malena, bleeding from the gums, cerebral haemorrhage. Haemorrhage into the vital organs or in the brain or retroperitoneum is usually fatal.

According to Reid et al (1963) hemoptysis is the earliest and commonest manifestation which can be seen as early as 20 minutes.

Shock is the main cause of death in case of viper. Shock occurs due to several factors which includes hypovolemia due to loss of plasma and blood into the bitten area, pulmonary intravascular clotting, cardiac effects, pulmonary edema and serum enzyme levels.

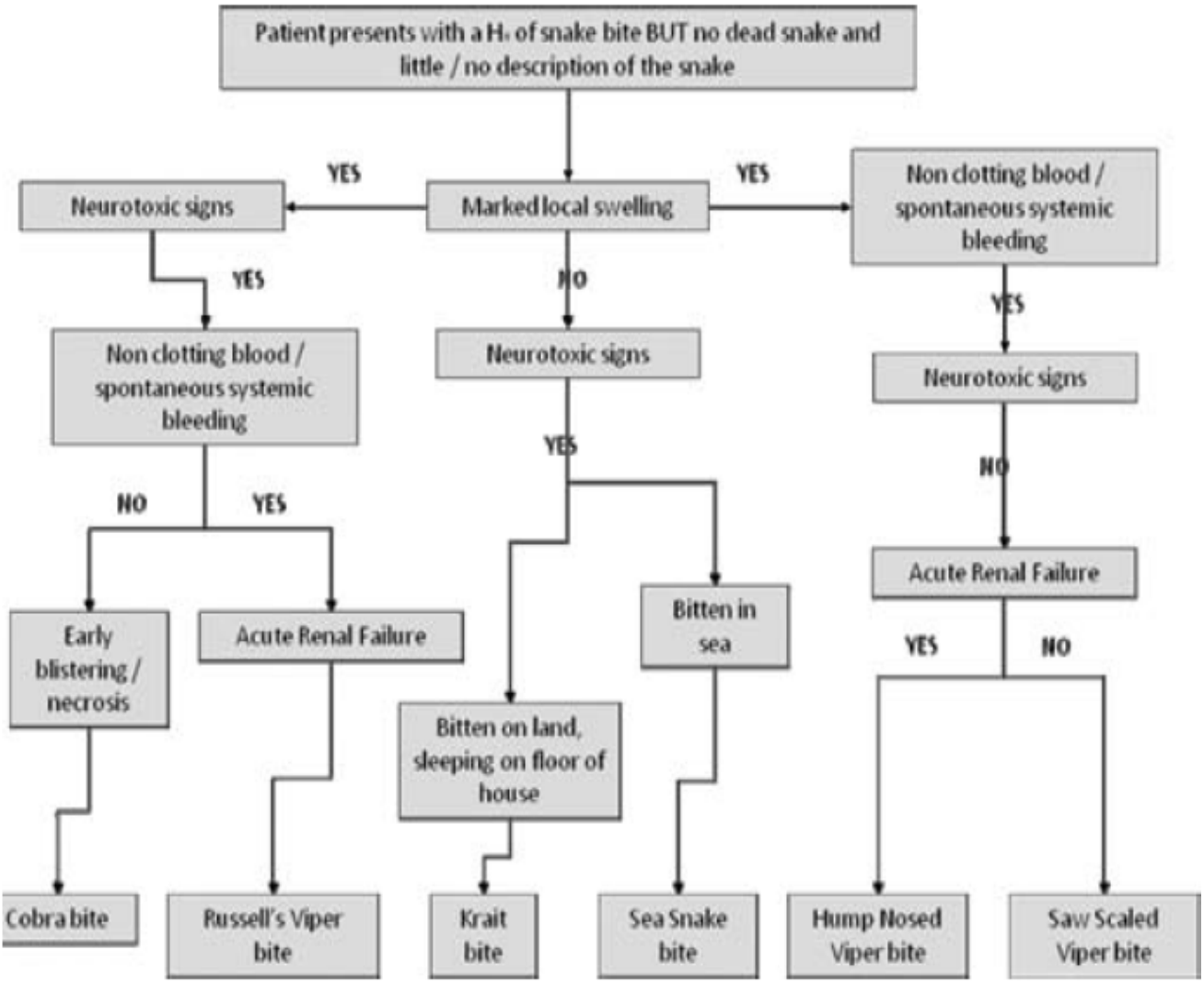


Figure 13- Algorithm for Identification of snakes based on clinical symptoms

COMPLICATIONS OF SNAKE BITE:

It includes

- Renal failure
- Gangrene
- Compartment syndrome
- Non-bacterial thrombotic endocarditis
- Respiratory paralysis
- Guillain barre syndrome

RENAL FAILURE:

Direct cytotoxic effect of snake venom is suspected to cause acute kidney injury. Symptomatology includes oliguria and electrolyte and fluid imbalances. Renal biopsy of the snake bite shows either acute tubular necrosis or patchy and diffuse cortical necrosis. Interstitial nephritis, papillary necrosis and glomerulonephritis occur very rarely.(8)

GANGRENE:

Cobra produces wet gangrene and viper produces dry gangrene. Secondary infection can occur in the necrotic debri.

COMPARTMENT SYNDROME:

It mainly occurs in case of cobra bite. It is a very rare complication. It occurs due to the venom injection into the intramuscular plane.

NON-BACTERIAL THROMBOTIC BACTERIAL ENDOCARDITIS:

It usually occurs in patients with wasting disease, damaged valves due to intracardiac foreign body, marked turbulence.

RESPIRATORY PARALYSIS:

It is seen in case of cobra and krait bite. The presentation in early stages include tachypnoea,confusion, tachycardia,stupor, coma, respiratory failure and death. Respiratory failure occurring in case of snake bite is mainly type-II respiratory failure.

GUILLAINE-BARRE SYNDROME:

It is an unusual complication which occurs due to krait. Symptoms of symmetric paralysis and sensory signs, facial nerve involvement, autonomic dysfunction and elevated CSF protein can occur(14). Nerve conduction study reveals profound sensory and motor polyneuropathy.

RARE COMPLICATIONS:

- Sub arachnoid haemorrhage
- Hypo-pituitarism(14)
- Bilateral thalamic hematoma
- Hysterical paralysis
- Second degree heart block
- Acute MI due to dyselectrolytemia

TABLE 2-IDENTIFICATION OF SNAKES BASED ON THE SYNDROMIC APPROACH

Syndrome	**Species**
Local swelling with bleeding manifestation	All viper
Local swelling with respiratory paralysis	Cobra
Respiratory paralysis without local envenomation	Krait
Local swelling with bleeding/shock/renal failure	Russell's viper

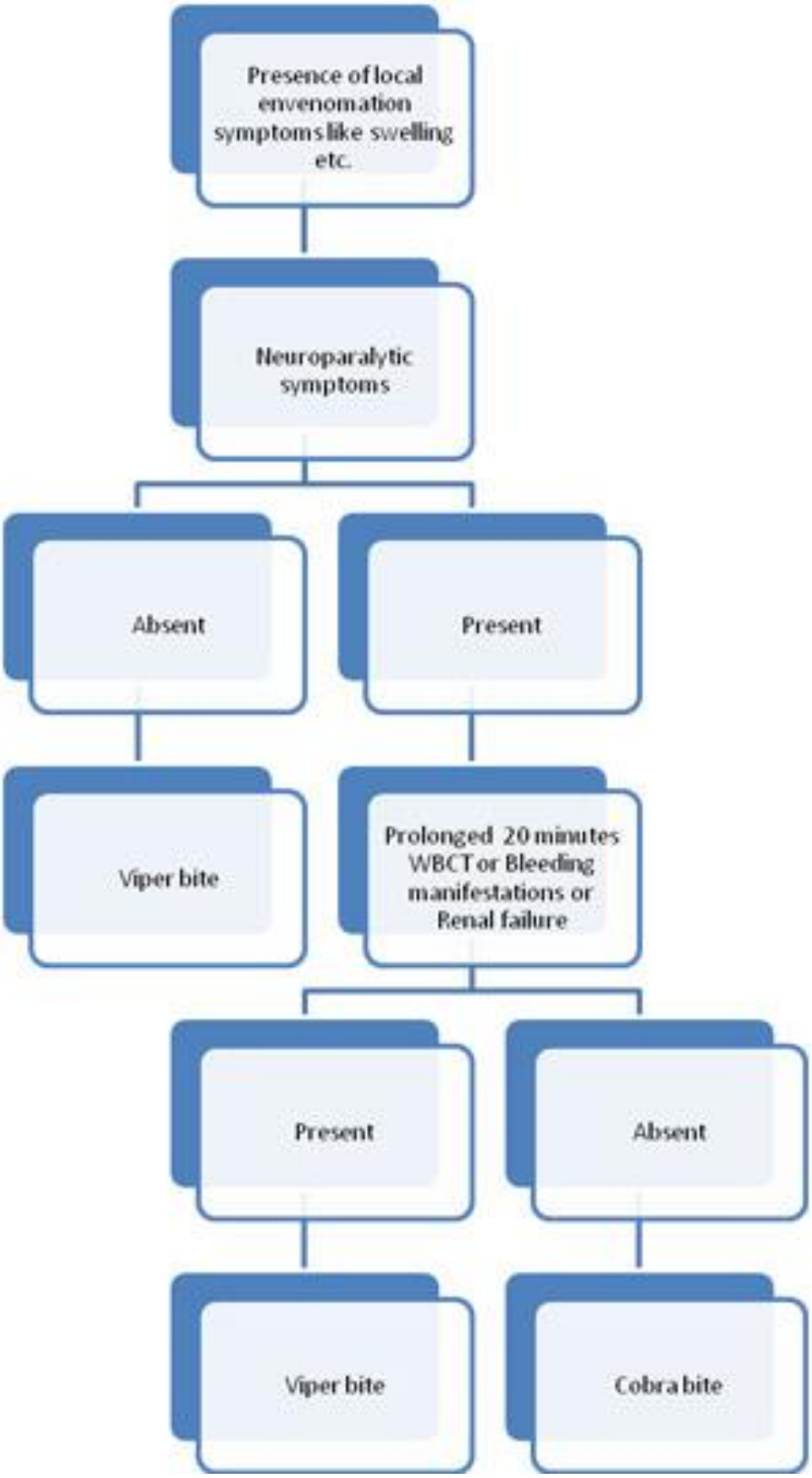


FIGURE 14- SPECIES IDENTIFICATION IN SNAKE BITE

INVESTIGATIONS

The diagnosis is mainly based on the clinical findings.

- **20 minute WBCT:**

It is usually performed at the bed side, very informative test. It doesn't require any technical assistance. It is the most reliable test for coagulation. It is usually performed in a clean, dry, new glass vessel.

Few ml of blood should be drawn from the vein and sample is poured into the clean,dry test tube and it should be kept in the room temperature for 20 minutes. It should not be disturbed for 20 minutes and it should be gently tilted, it should not be shaken. The vessel should be clean and dry because the dirty tube/ when rinsed with detergent it will interfere with the clotting mechanism. After 20 minutes if the blood is in liquid state it is considered as incoagulable blood. Incoagulable blood indicates the bite is due to viper.

- Elevated WBC count indicates severe poisoning
- Fibrinogen is decreased and FDP is increased in case of DIC
- Serum lactate in case of acidosis
- Serum enzymes: raised CPK- suggestive of skeletal muscle damage.
- LFT: deranged in case of hemolysis with elevated levels of unconjugated bilirubin.

- Urine examination detects the microscopic hematuria in case of viper and myoglobin in case of sea snake poisoning.
- Chest x ray: shows pulmonary haemorrhage in case of viper
- ECG: ECG changes are unusual. ST-T changes, AV block can occur due to cardiotoxicity
- CT brain: hemorrhages in the brain seen in case of fatal viper bites. It is seen very rarely.
- Blood urea and creatinine: for assessing the renal function in case of viper
- Serum electrolytes: serum potassium level may be elevated in case of sea snake poisoning
- Retic count: increased in case of hemolysis
- Peripheral smear examination: spherocytes, Heinz body and acanthocytes in case of hemolysis.
- Fundus examination: for intra retinal or vitreal haemorrhage in case of severe viper bite.
- RBC casts can be identified in urine sample, if the victim has associated glomerular injury.

MANAGEMENT:

FIRST AID TREATMENT PROTOCOL:

Most effective way of giving first aid to the patient is shifting him to the nearest hospital as early as possible.

Our aim should be to preserve the life of the victim, reduce the absorption of venom, prevent complications before the victim reaches the hospital. But most of the methods carried at the level of the bitten area is mostly dangerous and ineffective. Giving reassurance for the patient and immobilising the limb are the two important first aid which can be done at the field level.(3)

Recommended first aid method in India:

It is based on the mnemonic:

Do it **R.I.G.H.T.**

R- Reassuance of the patients

I- Immobilisation of the limb

G.H.- get to hospital immediately

T- Tell to the doctor about the symptoms.

PRESSURE IMMOBILISATION METHOD (PIM):

This method is not applicable in India. This was first discovered by Sutherland in Australia in 1974. Application of integral splint and crepe bandage at a pressure of 55 mm of mercury would reduce the absorption of venom. But it has limitation if the victim walks for 10 minutes with the splint this method is ineffective. Later in 1994, Howarth identified that the pressure for immobilisation in upper and lower limb is different. Lower limb pressure was about 55-70 mm of mercury and for upper limb is 40-70 mm of mercury. For the above constriants, this method is not applicable in India.

MONASH TECHNIQUE/PRESSURE PAD:

To reduce the amount of venom entering into the system, hard pad of rubber is tightly applied to the wound. But this method is under research in India to assess the efficacy. This technique is highly useful in case of Indian armed forces.

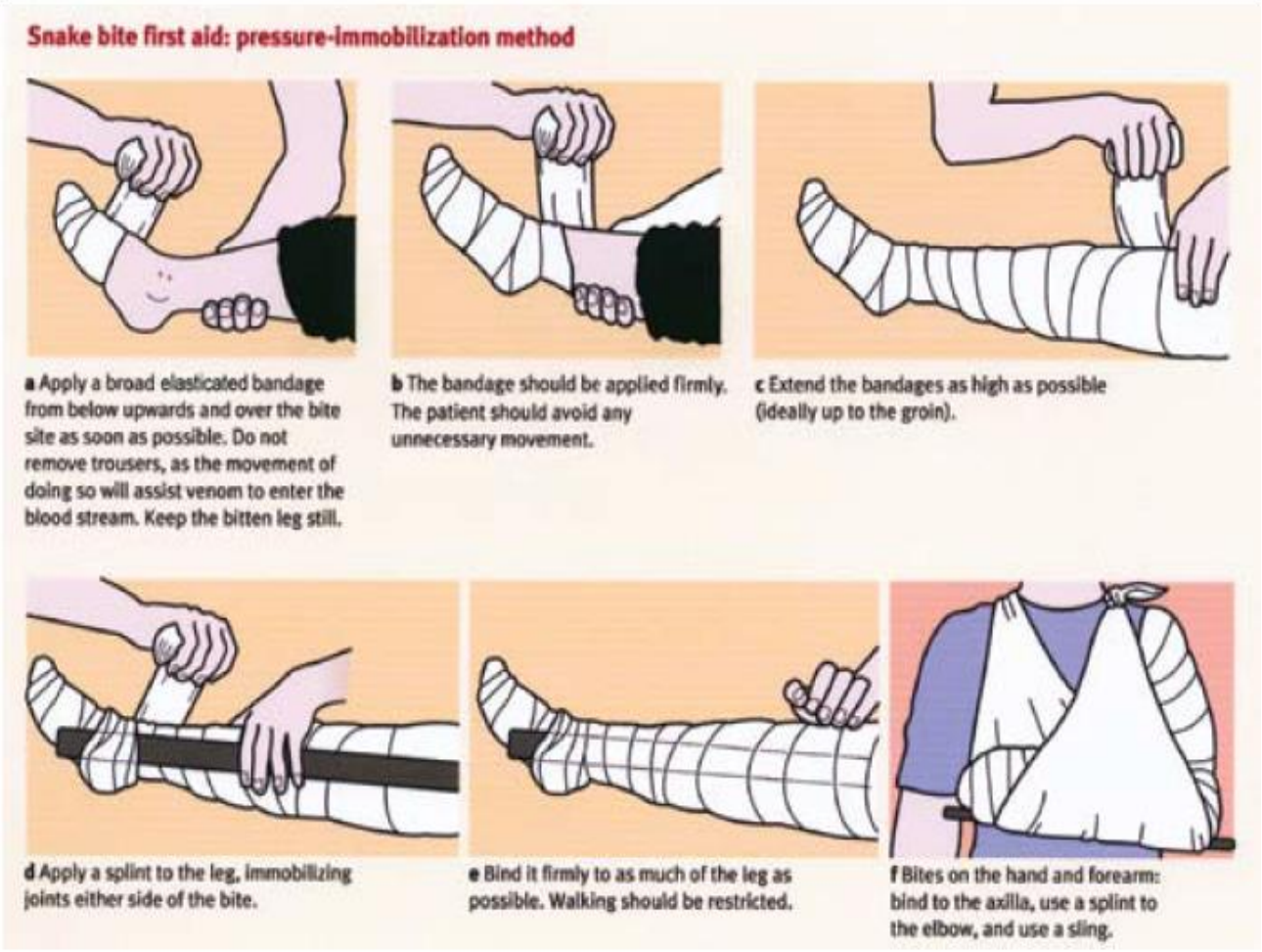


FIGURE 15- PRESSURE IMMOBILIZATION (PIM)

SNAKE BITE TREATMENT PROTOCOL:

According to the national snake bite protocol, treatment for snake bite includes the

- Diagnostic phase
- Treatment phase

DIAGNOSTIC PHASE:

Diagnosis:

Identification of species is important for clinical management. Diagnosis can be established by identifying the dead snake or by the syndromic approach. Sometimes the snake can be brought to the hospital by the relatives either dead or alive, which helps in identifying the species. Snakes should not be handled directly, because the bite reflex in the decapitated snake is highly uncontrolled, it can eject venom for as long as 1 hour after death(34)

Non-venomous or venomous snake:

It is very important to differentiate between the venomous and non-venomous bite and from other animals bite, it helps in treating the patient effectively. Fang marks are not diagnostic of snake bite but it is a highly sensitive sign. In the absence of positive identification, diagnosis is made from the symptoms and objective signs. (7)

Patient assessment:

Patient is quickly assessed for the airway, breathing and circulation. All patients should be in observation for minimum of 24 hours. Antibiotic use is not routinely recommended, if the patient has cellulitis or necrosis antibiotics should be given. If the skin in the bitten area is broken, T.T. injection should be given.

INDICATIONS FOR URGENT RESUSCITATION:

- Profound hypotension and shock
- Sudden cardiac arrest by hyperkalemia due to sea snake bite
- Renal failure
- Septicaemia due to local necrosis
- Respiratory failure
- Sudden deterioration occurs due to the sudden gush of venom entering into the systemic circulation

TABLE 3-CLINICAL FEATURES AND TREATMENT RESPONSE OF POISONOUS SNAKES (7)

FEATURE	KRAIT	COBRA	SAW SCALED VIPER	RUSSELL VIPER	HUMP NOSED VIPER
Local pain/ tissue damage	No	Yes	Yes	Yes	Yes
Hemostatic abnormalities	No	No	Yes	Yes	Yes
Renal complications	No	No	No	Yes	Yes
Ptosis/ neurological signs	Yes	Yes	No	Yes	No
Response to neostigmine	No	Yes	No	No	No
Response to ASV	Yes	Yes	Yes	Yes	No

24 hours observation is must for all the patients this is because of late onset of envenomation especially the hump nosed pit viper and krait causes late onset of symptoms, but this usually occurs between 6-12 hours. This is because when the juvenile snakes bite the victim in the thicker area of skin symptoms usually occur late.

GRADING OF SEVERITY OF ENVENOMATION:

Grade	Fang marks	Pain	Local symptoms	Systemic symptoms
0- No envenomation	+/-	No	No	No
1- Mild envenomation	+	Moderate	Erythema, Edema <15 cm	No
2- Moderate envenomation	+	Severe	Ecchymosis, erythema, edema 15-30 cm	Nausea, Vomiting, syncope, thrombocytopenia, anaemia, weakness
3- Severe envenomation	+	severe	Edema>30cms, Erythema, Ecchymosis, Blisters	Hypotension, Respiratory failure, Coma, Paraesthesia.

ANTI-SNAKE VENOM(ASV):

It is the only specific treatment available for snake bite. ASV was introduced at institute Pasteur in 1890 by Albert Calmette. Anti venom is purified from the plasma of horse, donkey, sheep which had been immunised with venom of one or more species. It is immunoglobulin, it is an enzyme refined $F(ab)_2$ fragment of Ig G. ASV is available in both lyophilised and liquid forms. Lyophilised in powder form,only to be kept cool, highly useful form in remote areas where the power supply is inconstitent. Usually hospitals will have the lyophilised forms for long term storage of ASV. Liquid ASV requires a proper cold chain for maintaining the efficacy and has a shelf life of about 2 years.

TYPES OF ASV:

It can be either monovalent or polyvalent antivenom. Monovalent antivenom is effective against single snake. Polyvalent antivenom neutralises the venom of several species of snakes

COMPOSITION:

Every vial should be restituted with 10 ml of sterile water and the it contains the following constituents:

- Cobra -0.6 mg
- Russell viper -0.6 mg

- Common krait -0.45 mg
- Saw scaled viper -0.45 mg
- Preservative: cresol I.P. – 0.25%
- Stabiliser - glycine I.P
- Excipients - mannitol and sodium chloride

ASV is helpful if it is given within 4 hours of the bite, it is of less value when it is given at 8 hours, and is of doubtful value when it is given after 24 hours.

ASV manufacturers in India

:

- VINS bio-products, Hyderabad
- Serum institute of India, Pune
- Biological E, Hyderabad
- Haffkine bio- pharmaceuticals corporation, Mumbai
- Bengal chemicals and pharmaceuticals, Kolkata
- Bharat serums and vaccines, Mumbai

They produce about 1 million vials annually. Assuming an average dose of 10 to 20 vials per envenomed victim, current capacity exists to treat 50,000 to 1,00,000 envenomed patients on yearly basis in India.

INDICATIONS FOR ASV:

Signs of Systemic envenomation-

Neurotoxic features- muscle paralysis, ptosis, neck muscle weakness, external ophthalmoplegia

Coagulopathy- prolonged WBCT, spontaneous systemic bleeding

Cardiovascular manifestations- abnormal ECG, arrythymias, hypotension,shock

Persistent vomiting and abdominal pain

Acute kidney injury- rising creatinine, oliguria and anuria

Signs of local envenomation-

Local swelling in the bitten area when it involves more than half of the limb

Rapid extension of swelling

Enlarged lymph node in the bitten area

MODES OF ADMINISRTATION OF ASV:

It can be given either by subcutaneous or intramuscular or intravenous route. Subcutaneous and intramuscular route is not usually preferred route. Intravenous route is the most commonly encountered route of administration of ASV. Local injection of ASV at the site of bite is not usually recommended, as it increases the risk of compartment syndrome.

- ***Intravenous route***

It is the most preferred route of administration, it can be administered in two methods as follows, intravenous push technique or intravenous infusion.

1. Intravenous " push" injection- Highly Economical, should be given by slow intravenous infusion, should not be given more than 2ml/min. This method has the merit that early reactions due to ASV can be observed and can be treated early also.
2. Intra venous infusion- ASV is diluted in 5-10 ml/kg body weight of isotonic fluid, and infused at a constant rate for about 1 hour. During this period they are monitored closely for early anaphylactic reactions.

❖ ***Intramuscular route:***

Bioavailability of anti venom is very poor in case of intramuscular route, absorption is also slow in case of i.m. route because the antivenoms are large molecules. Disadvantages of i.m. route are pain in the injection site and hematoma occurs in case of viper bite.

Dosage of ASV:

Initial dose of the ASV should be administered to neutralise the venom injected during the bite. The venom injected during the initial bite is expected to be 5 mg- 140 mg, which makes the required dose between 10 -25 vials which neutralises 6-8 mg of Russell's viper. Half life of anti snake venom is about 90 hours.

The treatment protocol followed in our hospital is as follows:

- For hemotoxic snake bite- initial 8 vials, dose should be repeated if the bleeding persists or clotting time is not normalised . Later 5+5+5 vials should be given.(8+5+5+5 vials)
- For neurotoxic snake bite- initial 8 vials should be given and next dose should be given in 2 hours if there is no clinical improvement and if the patients develops neurotoxic manifestations. Later 8+5 vials of ASV given(8+8+5 vials)
- For local envenomation- Initially 8 vials of ASV vials given.

Test dose should not be administered for ASV. Test dose is not of any value in preventing the reactions, instead it pre-sensitises the individual and poses greater risk. ASV should be slowly administered in initial one hours and the patient needs to be monitored for 2 hours.

The dose of ASV in children is similar to that of adults i.e, same dose as that of adults. ASV is mainly to neutralise the venom, amount of venom injected by the snake is same in case of children and adults. In case if the individual presents late to the hospital with complications like renal failure, role of ASV is questionable. Do 20 minutes WBCT for that patient and if it is prolonged, ASV can be given. If not means, treat the renal failure by means of hemodialysis. ASV only acts if the venom is unattached form in the circulation.

Contra indication for ASV:

Per se there is no absolute contraindication for ASV administration. In case of atopic patients ASV should be given only if the patient developed signs of systemic envenomation.

MANAGEMENT OF SNAKE BITE IN SPECIAL SITUATIONS:

1. **Children**

   Dose of ASV administered in case of children is the same dose as that of adults. The amount of venom injected by the snake is same as in case of adults. Mortality is more in case of childrens due to larger body surface area.(17)

2. **Pregnancy**

   Dosage is same as that given in normal individuals. There is no clear cut evidence that the venom crosses the placental barrier. It doesn't have much influence on the outcome of the fetus, very rarely spontaneous abortion has been documented. If necessary the patient can seek the opinion of the gynaecologist regarding the outcome of the fetus.

ADVERSE REACTIONS OF ASV:

Adverse reactions of ASV are common and it may vary from minimal reactions to fatal anaphylaxis. Reactions are mainly complement mediated, not Ig G mediated.

It is usually of three types

1. Early(anaphylactic reaction)
2. Pyrogenic reactions
3. Late (serum sickness type) reactions

EARLY REACTIONS:

It usually occurs between 10-60 minutes after administration. Symptoms include tachycardia,itching,cough, urticaria, fever, nausea,vomiting,palpitation and headache. Of these about 5% of the patients exhibit severe anaphylactic reactions in the form of broncho spasm, angioedema,hypotension, sometimes very rarely death.

PYROGENIC REACTIONS:

These reactions are mainly due to endotoxins which usually occurs after 1-2 hours after administration. Symptoms include initially they presents with chill with cutaneous vasoconstriction, goose flesh, shivering. Due to intense vaso-dilation, temperature rises steadily followed by fall in mean arterial pressure. Due to associated GI symptoms such as vomiting and diarrhoea patient experiences decrease in body temperature.

LATE(SERUM SICKNESS) REACTION:

It usually occurs after 7 days. Symptoms include itching, urticaria, arthralgia,albuminuria,lymphadenopathy, flu like symptoms with fever, neurological symptoms like mononeuritis multiplex, GBS very rarely encephalopathy.

Management of ASV reactions:

Adrenaline 1 in 1000 in a dose of 0.5- 1 ml for adults and 0.01 mg/kg for children. It should be given by the subcutaneous route. In certain situations it can also be given by IM/IV/intracardiac route depending on the severity of reactions. Anti-histaminics shold be administered along with this. Oral steroids are given for late reactions(13) .

PROPHYLACTIC REGIMEN FOR ASV REACTIONS:

This is not routinely recommended. This regimen is mainly indicated for atopic individual or highly sensitised individual.

Two regimens are used:

1. 0.25-0.3 mg adrenaline 1:1000 given subcutaneously
2. 100 mg of hydrocortisone and 10 mg of avil injection should be given before 5 minutes. In children, Anti- histaminics should be cautiously used. Dose in case of children is 2 mg/kg of hydrocortisone and 0.1-0.3 mg/kg of H 1 blocker.

Neostigmine test:

Victims bitten by the cobra will respond to neostigmine very well. Initially atopine 0.6 mg should be given IV and followed by neostigmine should be given IM in the dose of 0.02 mg/kg for adults. Positive test includes that the patient will have improvement in the ptosis and ventilatory capacity will improve.(8) Improved individuals should be maintained on 0.5 mg of neostigmine IM,0.6 mg of atropine IV for about 8 hours.

RECOVERY SIGNS:

If the patient had received the adequate dose of ASV, the patient will exhibit some signs of recovery following ASV administration. Signs seen in the patients showing recovery are

- WBCT should be restored within 6 hours.
- BP increases after 30 minutes in case of hypotensives.
- Spontaneous bleeding usually arrests within 15-30 minutes.
- In case of active hemolysis,rhabdomyolysis and urine returns to normal colour within few hours.
- Neurotoxic manifestations of cobra bite improves within 30 minutes.

MANAGEMENT OF COMPLICATIONS:

Complications can arise in any phase of treatment. This should be managed in tertiary care centres. The complications include:

1. Renal failure
2. Severe bleeding
3. Hypotension
4. Sepsis
5. Cardiac complications
6. Compartment syndrome
7. Neurological sequelae

RENAL FAILURE:

It is seen in case of hump pit viper and russell viper. Renal failure occurs due to direct venom effect, rhabdomyolysis, hypotension,intravascular hemolysis,DIC. Renal failure is indicated by raising serum creatinine, reduced urine output in the form of oliguria/anuria, classical uremic syndrome, acidosis.(11)

Hemodialysis or PD should be performed in the patients with features of acidosis, hyperkalemia, creatinine >4mg/dl,uremia. In case of rhabdomyolysis, acidosis should be corrected with bicarbonate, saline diuresis should be maintained.

SEVERE BLEEDING:

Bleeding manifestations will usually be corrected with the ASV. Heparin and anti-fibrinolytics should not be given. In these patients, IM or SC injectin should be avoided. They should br treated with FFP, cryoprecipitate,platelets or whole blood.

HYPOTENSION:

Hypotension may occur due to various reasons like cardiotoxicity, vaso-dilatation due to venom, hypovolemia, ASV reaction, acute pituitary adrenal insufficiency in Russell viper. Hypotension should be treated with dopamine, vaso-constrictor in the starting dose of about 2.5-5mcg/kg/min. steroids are used in case of adrenal insufficiency.

CARDIAC COMPLICATIONS:

This is unusual and rare complication. The manifestations include sinus arrthymia, bradycardia, tachycardia,gallop rhythm and AV block. If the rhythm disturbances are persistent, cardiologist consultant is must for managing the patient.

COMPARTMENT SYNDROME:

Immobile, cold, swollen and pulseless limb indicates the compartment syndrome with increased intracompartmental pressure. It is characterised by the 6Ps which includes pallor, paralysis, pulseless,pain on stretching the limb, pain out of proportion to swelling,paraesthesia. This syndrome is less common in India. It can occur in case of cobra. By using stryker pressure monitor intra compartmental pressure is measured. Criteria for fasciotomy in compartment syndrome includes when there is increased intracompartmental pressure > 40 mm of Hg, and if the patient is also having the clinical features of compartmental syndrome.

MANAGEMENT OF COBRA SPIT OPHTHALMIA:

It includes

- Decontamination with copious amount of saline
- Topical administration of 0.5% of adrenaline- relives pain and reduces inflammation
- Topical cycloplegics for relieving the discomfort and ciliary spasm and for preventing the posterior synechiae formation
- Topical anaesthetics- tetracaine which relieves the pain
- In case of allergic conjunctivitis, antihistaminics are administered.
- Topical anti venom should not be used .because it causes irritation of the eyes
- Topical antibiotics are given for the corneal ulcer

Neurological manifestations:

In case of diaphragmatic paralysis, patient should be provided invasive mechanical ventilation. This mainly occurs in case of cobra and krait bite.

PREVENTION:

Snake bite is the major problem in case of rural areas especially those who working in the fields.(17) The major situational source of bite is while cutting the grass. Majority of the bites occur during the night or in the early morning(18). Simple precautions should be taken to prevent the chance of getting snake bite, this is by means of understanding the habits about the snakes.

- ❖ Avoid walking in bare foot in night
- ❖ Use torch lights in night to avoid being bitten by the snake
- ❖ Avoid sleeping in the ground
- ❖ Walk with heavy steps in the night times this produces the vibration which keeps aside the snake
- ❖ Keep the waste things away from the home, these things will attract the rat and snakes will enter the human dwellings in search of its prey
- ❖ Use sticks to strike the base of the leaves while cutting the grasses
- ❖ Never put your hands into the blind hole before inspecting
- ❖ Keep plants away from the doors or windows.
- ❖ Protective clothing like long trousers, socks and thick leather shoes should be worn
- ❖ Never handle a dead snake in bare hands. Because they continue to eject venom after one hour of decapitation

- ❖ Indoor toilets should be made compulsory for new house-bearers. This will avoid being bitten by the snake
- ❖ Particular care should be taken while collecting the firewood,moving logs,boxes and trees covered with dense foliage
- ❖ Venomous snakes should never be kept as pet or performing animals
- ❖ Snakes should never be attacked, disturbed

PROPHYLAXIS:

Venoids(venom toxoids) has been used to immunise the farmers who are at high risk. In some areas, there has been research going on for the production of venoid against Russell viper, this is because of early development of renal failure.

The production and modification of venom antigen by means of genetic engineering leads to the production of snake venom vaccines. But these are under trail.

MATERIALS & METHODS

MATERIALS AND METHODS

Study centre: Poison centre, Institute of internal medicine, Rajiv Gandhi government general hospital, Chennai-3.

Study design: Retro and prospective study

Sample size: 50 patients admitted with history of snake bite are analysed comprehensively.

Duration of study: 6 months March 2014-August 2014

Inclusion criteria:

Patients admitted with history of snake bite showing features of neurotoxic manifestations in the form of

Ptosis

Extra ocular movement restriction

Neck muscle weakness

Respiratory failure

Exclusion criteria:

1. Patients in cholinergic crisis
2. Hypokalemia
3. Flaccid paralysis
4. Myasthenia gravis,myopathy.

METHODOLOGY

Data collection and methods:

Patients eligible for study are subjected to detailed history taking and clinical examination.

Methodology:

Patients admitted with of history of snake bite-selected for clinical study as per inclusion/exclusion criteria are subjected to detailed history taking and clinical examination after obtaining informed consent. Type of snake, site and number of bite,occupation,time delay in reaching the hospital,amount of anti snake venom needed,neurotoxic manifestations are recorded in detail. Routine blood investigations like complete hemogram,renal function tests,serum electrolytes,serum creatine kinase were done for all patients included in the study.

Detailed clinical examination will be done daily and close monitoring was done. Clinical progression over the day is observed in terms of deterioration of illness,recovery, death. Respiratory failure and need for mechanical ventilation among the study group was noted.

All patients included under the study were treated with anti-snake venom and other supportive measures. Mechanical ventilation were provided for

patients in respiratory failure. Patients in ventilator were assessed for the duration on ventilator and development of ventilator associated pneumonia.

They were followed till the end point of outcome either in the form of recovery or death. Outcome will be assessed with the following factors,

- Type of snake that biting
- Site of bite
- Time delay in reaching hospital
- Amount of anti snake venom needed
- Respiratory failure

Investigation details:

Serum creatinine kinase

Statistical analysis:

Statistical analysis was carried out for 50 patients after categorising each variable- Age, sex, occupation, place,time delay in reaching hospital,site of bite,amount of anti snake venom needed, respiratory failure and other clinical features and finally outcome.

Data were analysed using statistical package-SPSS software. The values are presented as mean, standard deviation, frequency of occurrence. Percentages were used to express the proportion of discrete variables.

The statistical significance was indicated by the

- **Chisquare(x2) test**
- **Fisher exact test.**

Variables were considered to be significant if $P<0.05$.

OBSERVATION
&
RESULTS

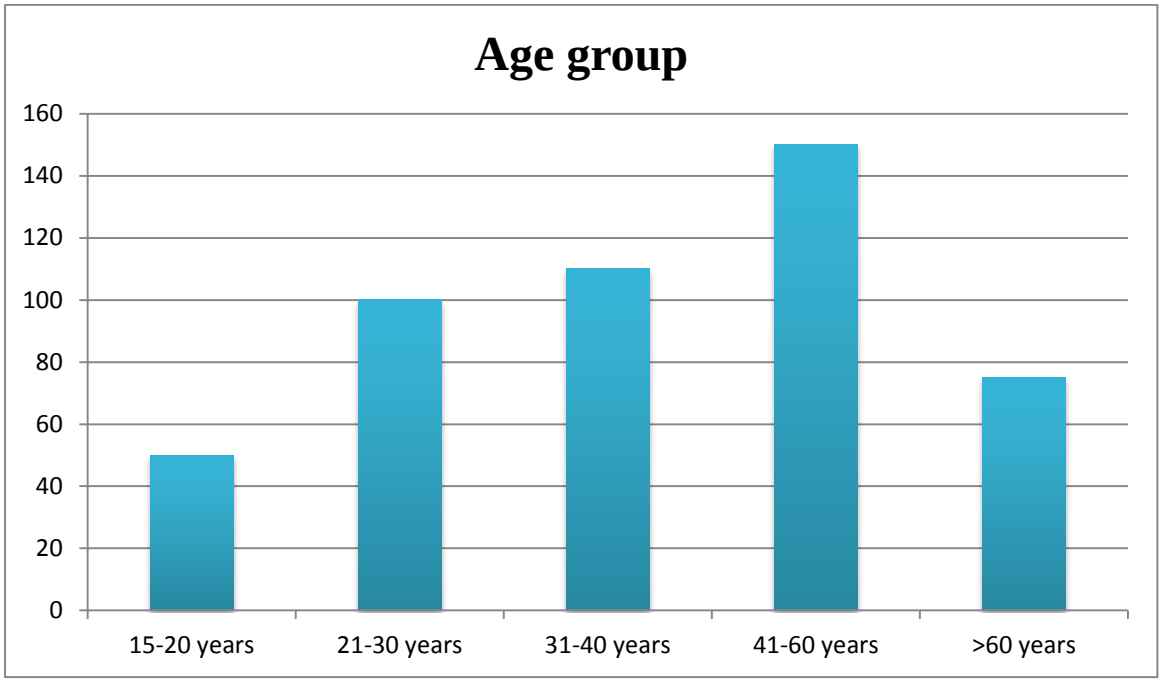
OBSERVATION & RESULTS

Table 4 – Age distribution

S.No	Age group in years	Frequency(n)	Percentage
1.	15-20	3	6%
2.	21-30	12	24%
3.	31-40	13	26%
4.	41-60	17	34%
5.	>60	5	10%
Total		50	

In our study, 17 out of 50 patients were in the age group between 41-60 years. But this is not statistically significant

Figure 16- Age distribution



Sex distribution

Among the 50 persons, 30 were found to be male and 20 were found to be females.

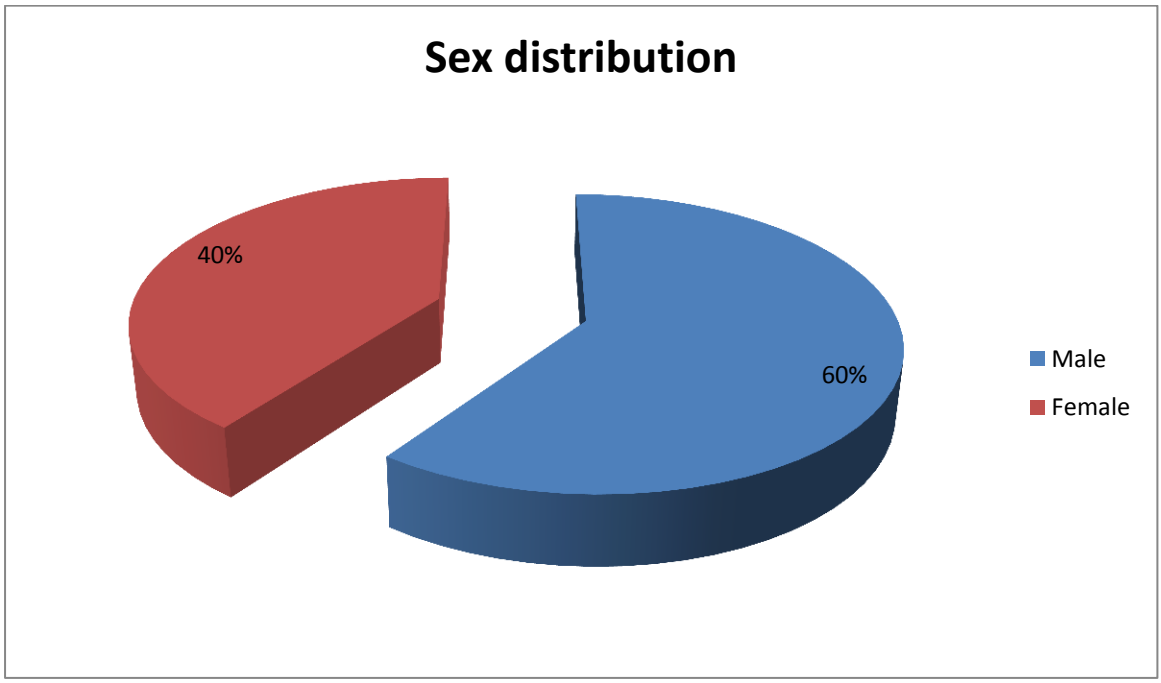


TABLE 5 . OCCUPATION AND OUTCOME

S.No	Occupation	Outcome		Total
		Recovery	Death	
1.	Agriculture	28(65%)	7(14%)	35(70%)
2.	Non-Agriculture	15(35%)	-	15(30%)
		43(86%)	7(14%)	50(100%)

70% of the cases were from agricultural sector and the remaining 30% of the cases from manual labourers and others.

Figure 17 - Occupation and Outcome

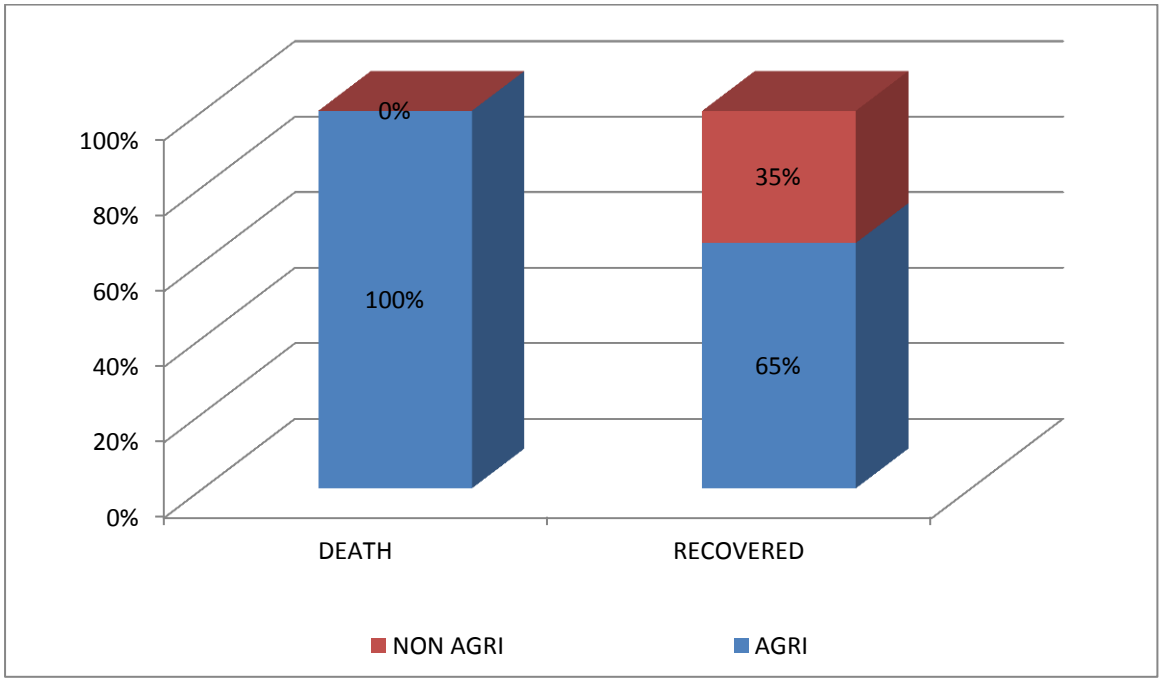


Table 6- Place and outcome

S. No.	Place	Frequency (n)	Percentage (%)	Recovery	Death
1.	Rural	39	78%	36	3
2.	Urban	11	22%	7	4
Total		50	100%	43	7

Among the 50 victims, 78% of them are from rural area and the remaining 22% are from urban area, in that 3 persons were died in the rural area and 4 were in the urban area.

Figure 18 - PLACE AND OUTCOME

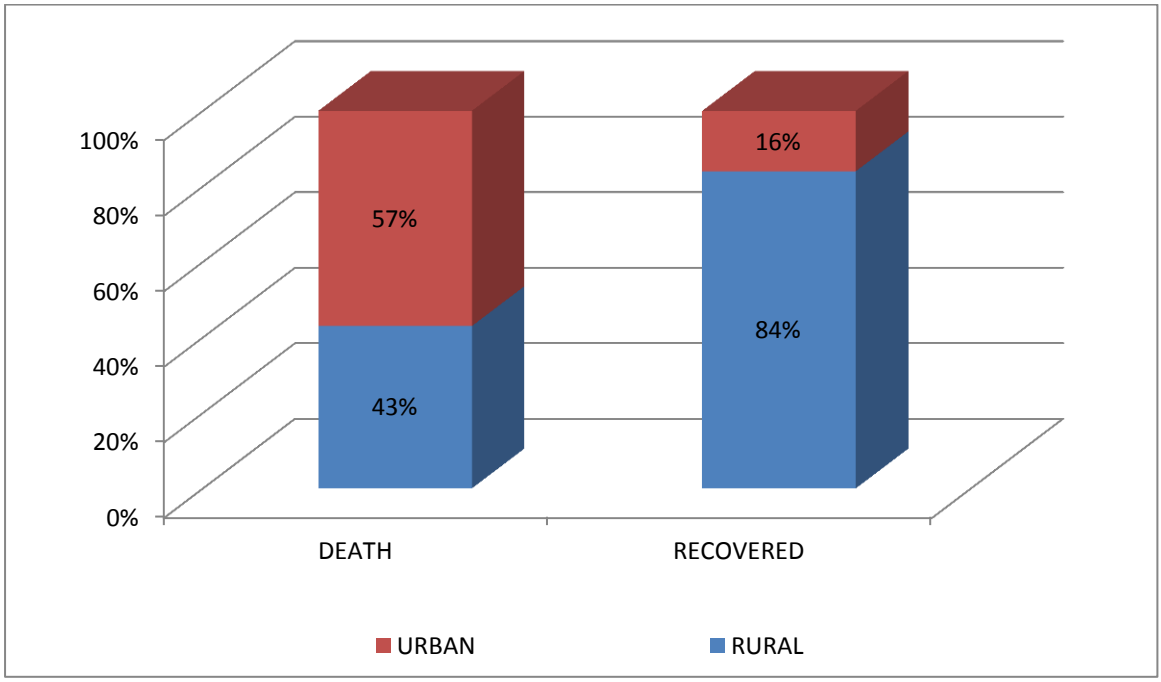


Table 7. TYPE OF SNAKE AND OUTCOME

S.No	Type of snake	Frequency (n)	Percentage (%)	Recovery	Death
1.	Cobra	24	48%	20(83.3%)	4
2.	Krait	15	30%	14(93.3%)	1
3.	Viper	11	22%	9(81.8%)	2
Total		50	100%	43	7

24 patients were bitten by cobra, 15 cases by krait and 11 cases by viper. 93% of the patients bitten by krait ,83% bitten by cobra and 81.8% bitten by viper were recovered and this is stastically insignificant(P-0.614)

Figure 19-TYPE OF SNAKE AND OUTCOME

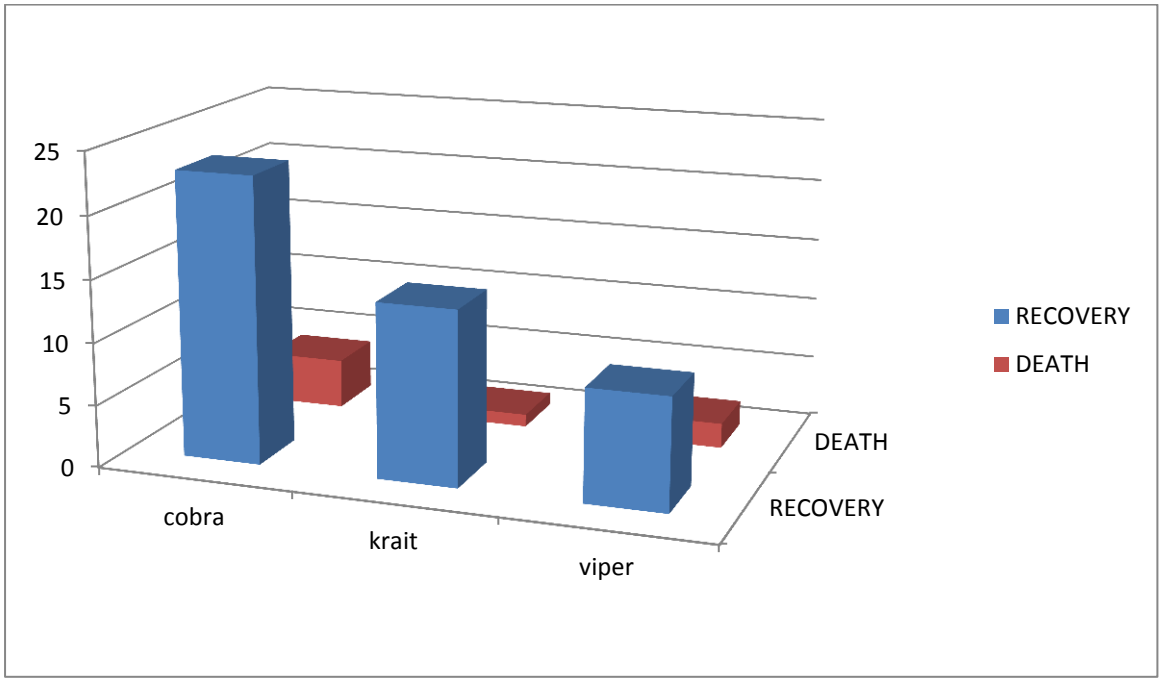


TABLE 8 - SITE OF BITE AND OUTCOME

S.No.	Site of bite	Frequency (n)	Recovery	Death
1.	Upper limb	14	12	2
2.	Lower limb	32	28	4
3.	Others	4	3	1
TOTAL		50	43	7

32 victims were bitten in the lower limb and 14 persons in the upper limb. According to this data, most common site of bite being the lower limb but this is stastically insignificant($P>0.05$)

FIGURE 20- SITE OF BITE AND OUTCOME

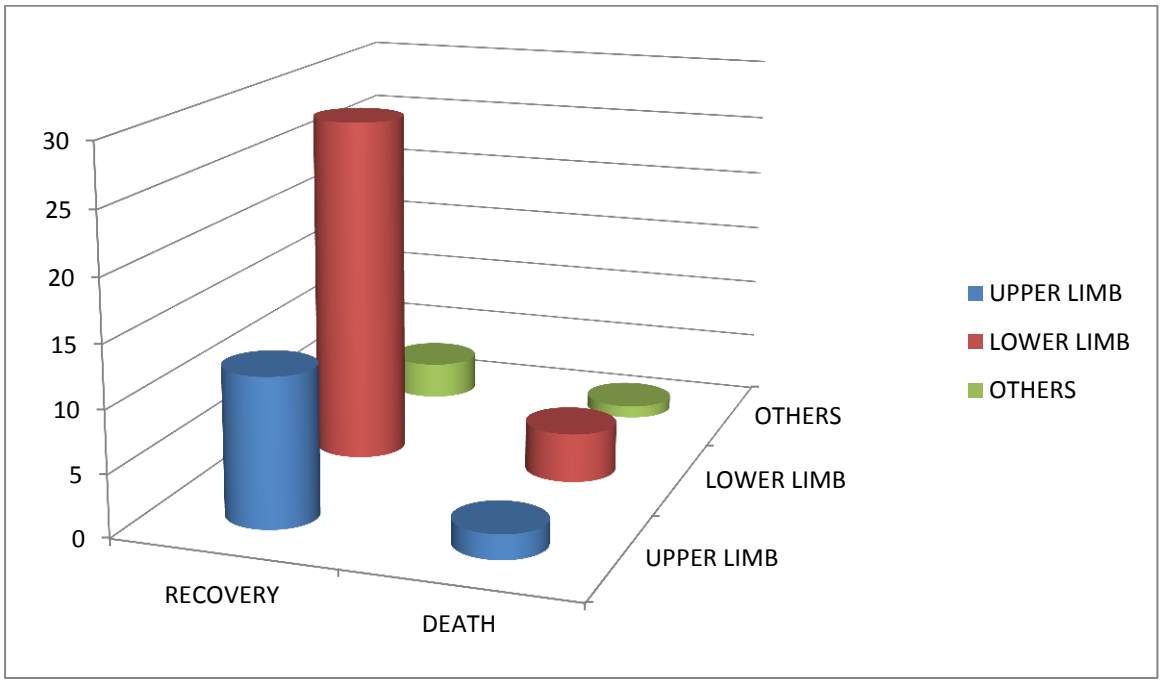


Table 9 – TIME DELAY AND OUTCOME

S.No	Time delay	Recovery	Death	Frequency (n)
1.	<3 hours	20(47%)	1(14%)	21(42%)
2.	3-6 hours	11(26%)	1(14%)	12(24%)
3.	>6 hours	12(28%0	5(7%)	17(34%)
TOTAL		43(86%)	7(14%)	50

Time delay in seeking the hospital treatment increases the mortality rate. Among the 7 persons who were dead, 5 cases were accessed the hospital premises late and this is statistically significant with P value of about 0.01.

Figure 21 - COMPARISON BETWEEN THE TIME DELAY AND OUTCOME OF PATIENTS

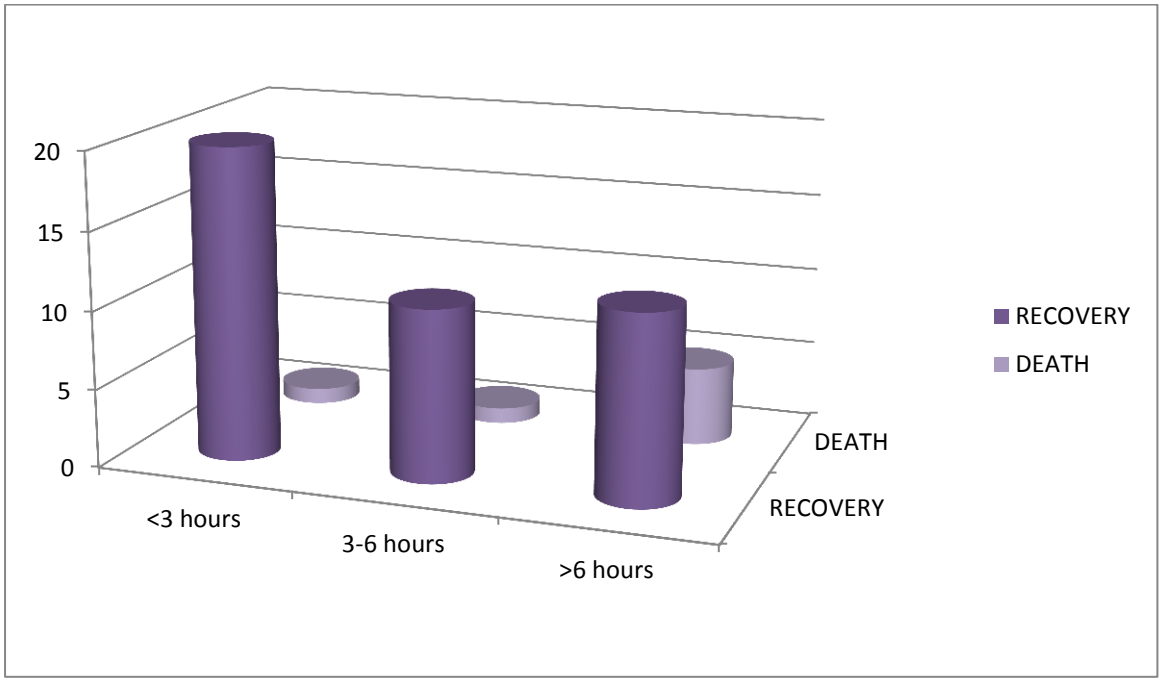


TABLE 10 - RESPONSE TO NEO-STIGMINE

Neostigmine response	Frequency (n)	Percentage (%)
Responder	24	48%
Non responder	26	52%
Total	50	100%

Of these 24 patients were responded to neostigmine while the remaining 26 were non-responders. Neostigmine responders were found to be bitten by the cobra.

Figure 22- RESPONSE TO NEOSTIGMINE

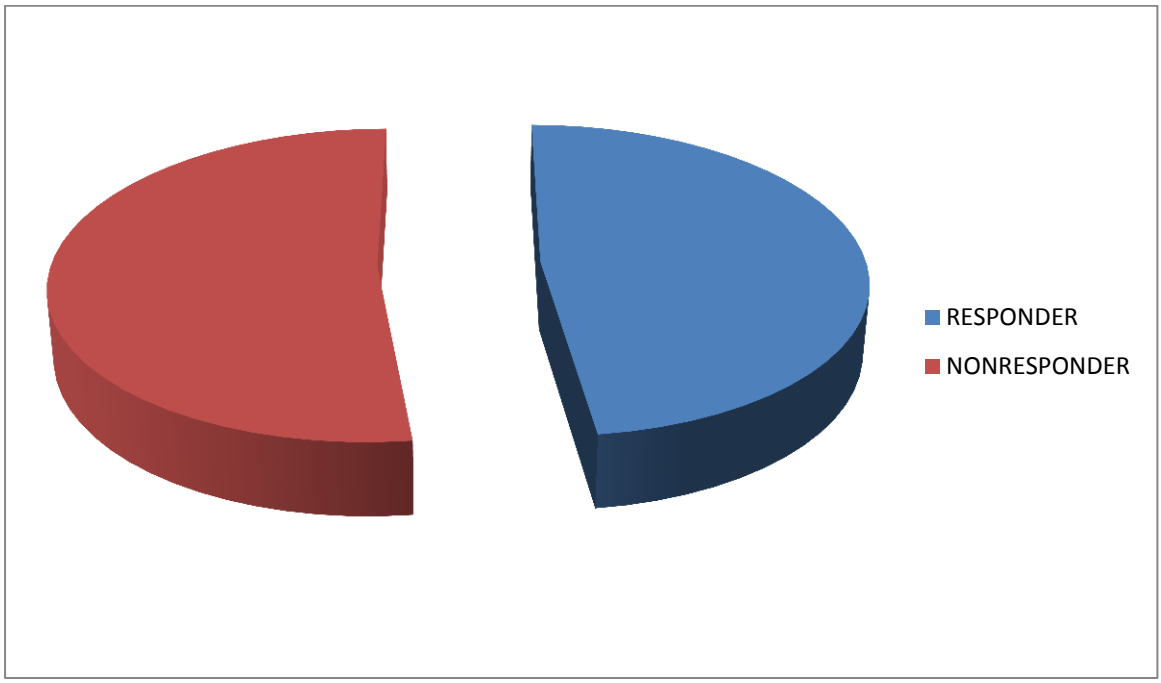


TABLE 11- DOSAGE OF ASV NEEDED

S.No	Dose of ASV needed	Frequency (n)	Percentage (%)
1.	16 vials	15	30%
2.	23 vials	35	70%
Total		50	

Among the 50 patients, 35 of the cases received ASV in the dosage of 23 vials and remaining cases received in the dosage of 16 vials.

FIGURE 23- DOSAGE OF ASV NEEDED

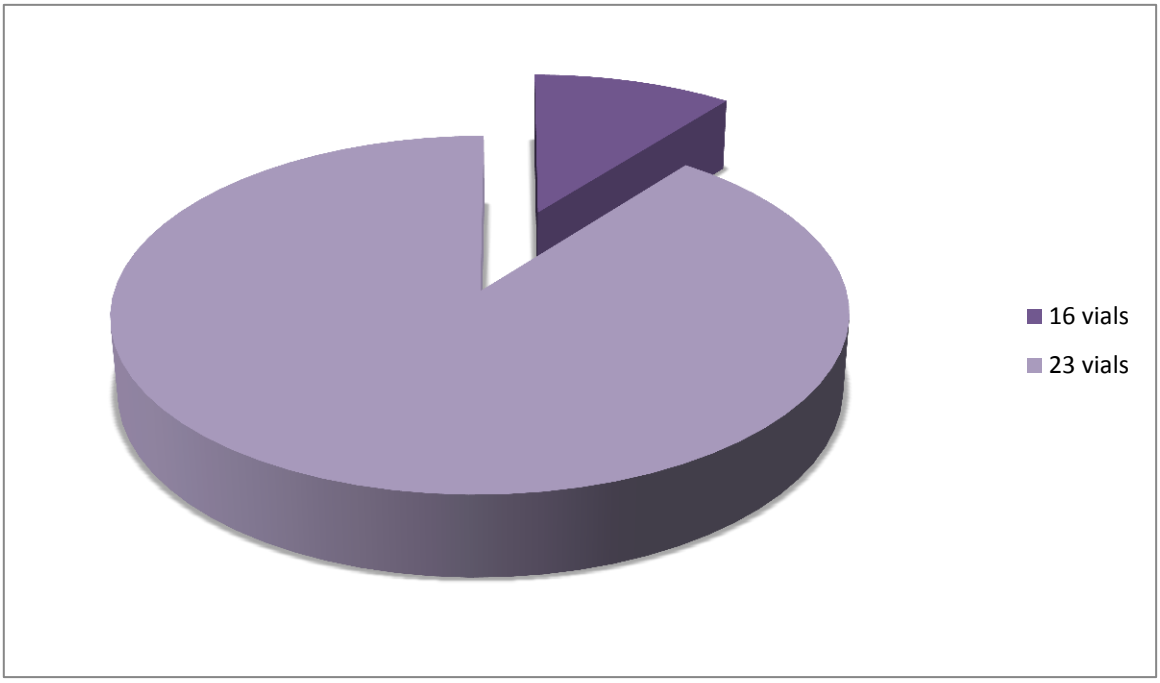


Table 12- FREQUENCY OF OCCURRENCE OF INDIVIDUAL PARAMETERS

S.No	Clinical parameter	Frequency (n)
1.	Ptosis	50
2.	EOM restriction	47
3.	Neck muscle weakness	43
4.	Muscle weakness	37

In our study group, all the 50 patients had ptosis, 43 patients had neck muscle weakness, 37 patients had muscle weakness.

FIGURE 24 - FREQUENCY OF OCCURRENCE OF INDIVIDUAL CLINICAL PARAMETERS

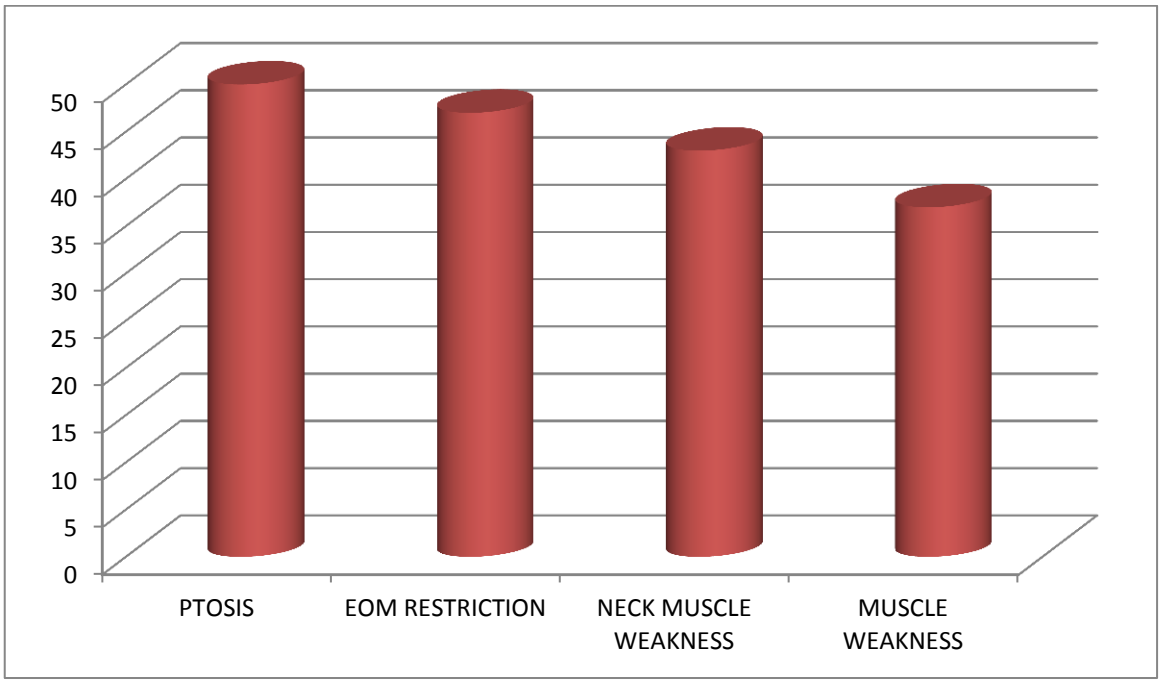


TABLE 13 - Respiratory failure and outcome

S.No	Respiratory failure	Frequency of occurrence (n)	Recovery	Death
1.	Yes	32(64%)	25(58%)	7(100%)
2.	No	18(36%)	18(42%)	0(0%)

In our study group, about 32 patients had respiratory failure. All the patients were given mechanical ventilator support. Number of death caused by respiratory failure is statistically significant(P value -0.02)

FIGURE 25 - RESPIRATORY FAILURE AND OUTCOME

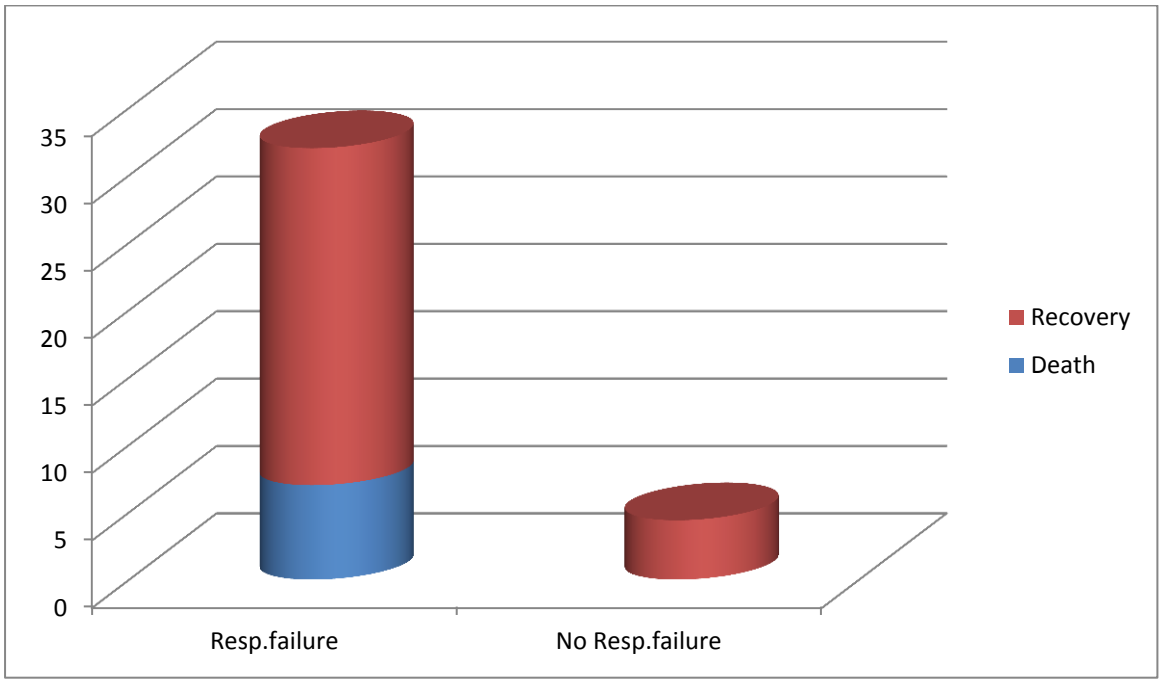


TABLE 14- DURATION OF VENTILATORY SUPPORT AND OUTCOME

S.No	Ventilator support duration	Frequency	Recovery	Death	Total
1.	<3 days	13 40.6%	13 48.1%	0	13
2.	3-6 days	13 40.6%	11 49.4%	2 28.6%	13
3.	>7 days	6 18.7%	1	5 71.4%	6
Total		32 100%	26	7	32

In our study, 32 patients needed ventilator support. Among them, 6 patients was on ventilator for more than 7 days and out of this 5 patients were died. Association between duration of mechanical ventilation and outcome is statistically significant (P value -0.012)

FIGURE 26 - DURATION OF VENTILATOR SUPPORT AND OUTCOME

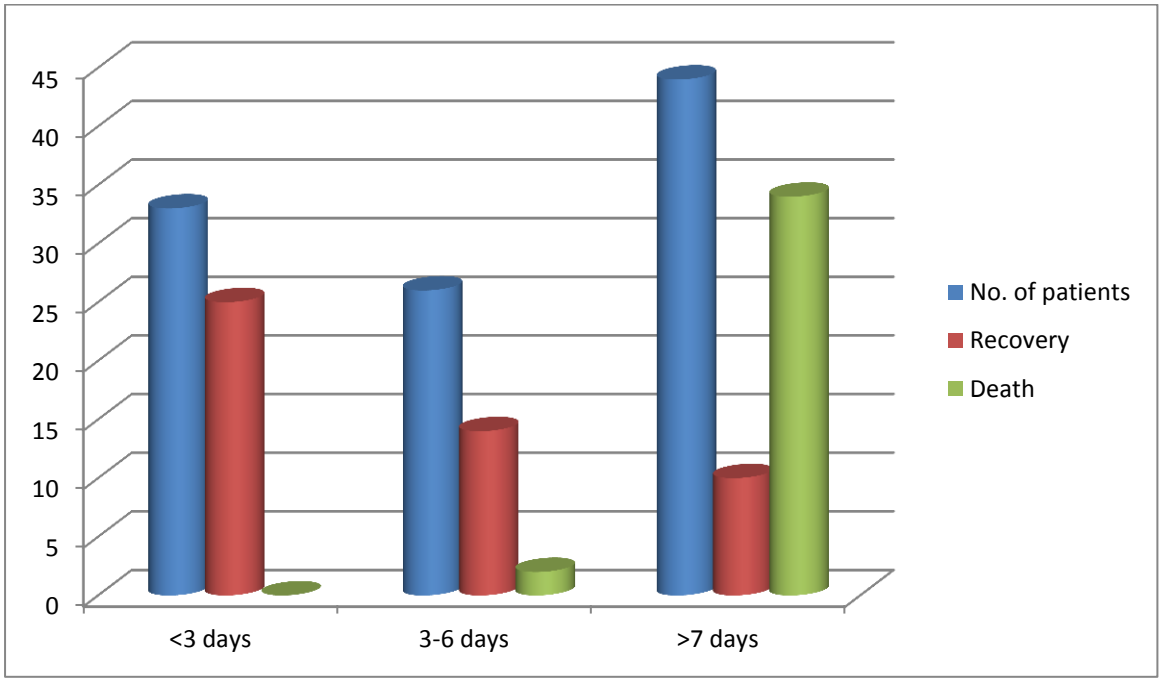


TABLE 15- COMPARISON OF OUTCOME WITH DEVELOPMENT OF VAP

S.No.	Ventilator support duration	VAP	Recovery	Death	Total
1.	<3 days	1	1	0	1
2.	3-6 days	5	4	1	5
3.	>7 days	6	2	4	6
Total		12			12

Association between the VAP and outcome was not statistically significant. Patients on ventilation for more than 7 days developed VAP. Thus the prolonged ventilatory support exposes the patient for acquiring VAP.

FIGURE 27- COMPARISON OF VENTILATOR SUPPORT AND OUTCOME

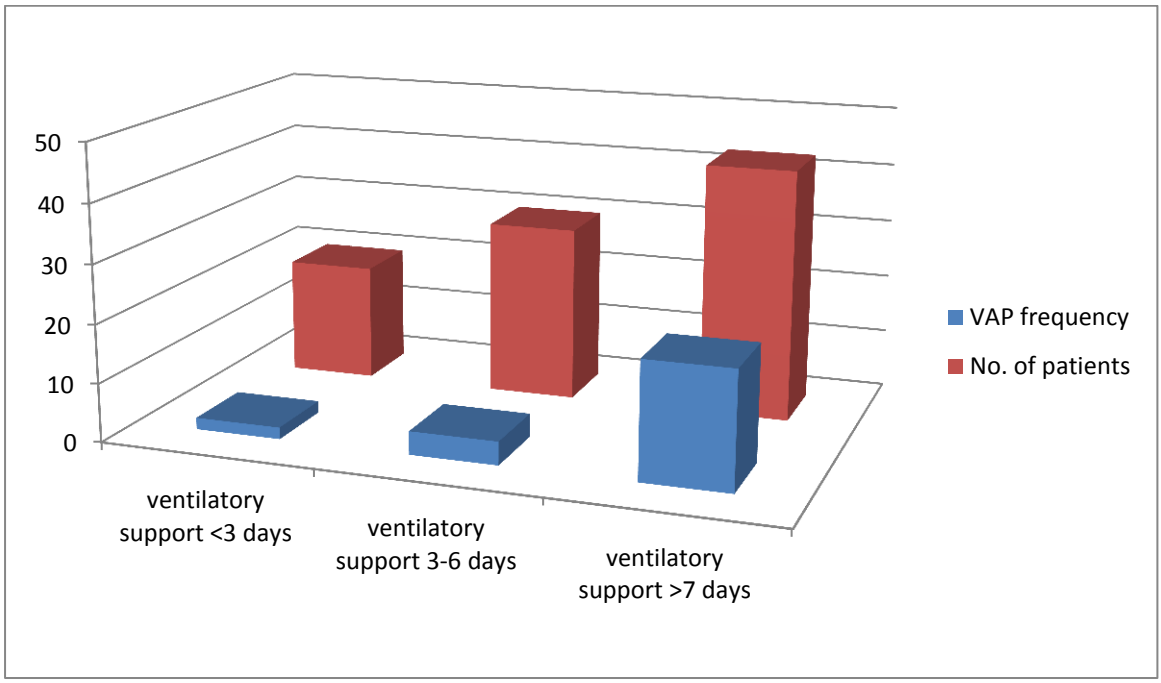
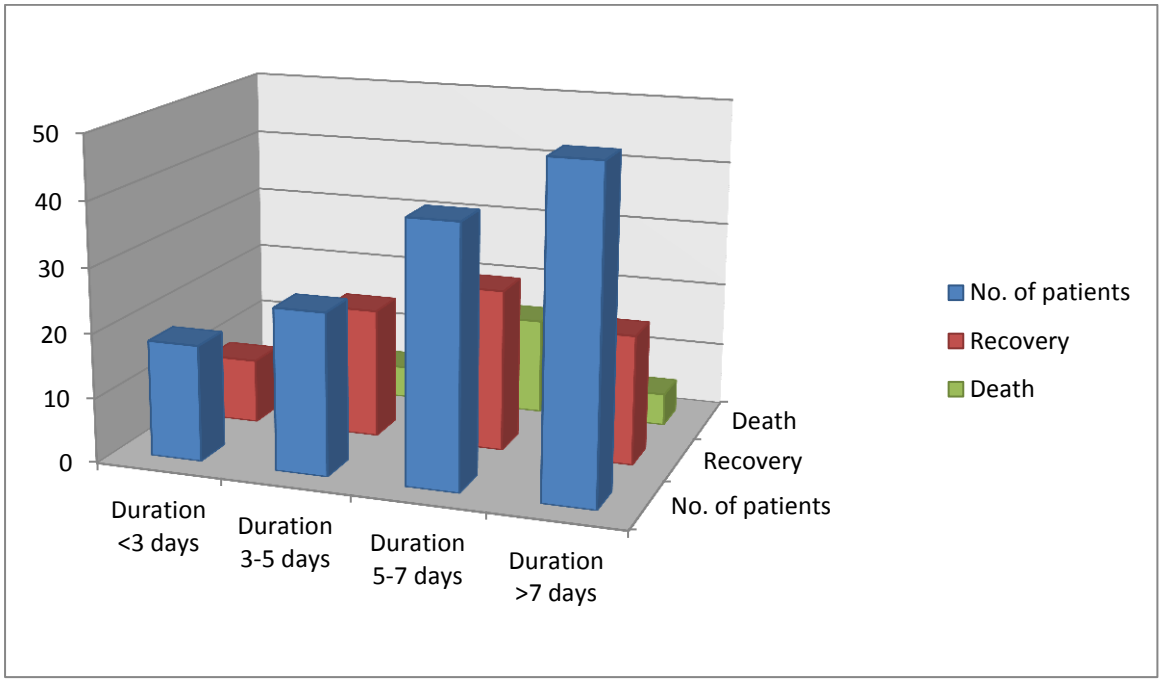


Table 16- Duration of stay in hospital and outcome

S.No	Duration of stay	Frequency (n)	Recovery	Death
1.	<3 days	1 2%	1 2%	0 Nil
2.	3-5 days	29 58%	28 56%	1 2%
3.	5-7 days	13 26%	10 20%	3 6%
4.	>7 days	7 14%	4 8%	3 6%
Total		50	43	7

In our study, the total number of patients stayed in the hospital for more than 7 days was about 7 patients, of this 3 patients were died. This was statistically significant($p<0.05$)

Figure 28- Duration of stay in hospital and outcome



DISCUSSION

DISCUSSION

Our study was conducted in the patients admitted with neurotoxic manifestations of snake bite. Our study group size was 50. Patients included in the study was closely monitored for the parameters listed in methodology. All the 50 patients was followed up till the discharge of the patients and the outcome was observed in terms of either recovery or death. Outcome analysis was done in comparison with parameters like type of snake, site of bite,time delay in reaching the hospital,amount of ASV needed, respiratory failure, duration of ventilatory support, VAP, duration of stay in hospital using Chi square test and Fisher Exact test. Following were the main observations from our study conducted in the snake bite patients (n-50).

AGE AND SEX DISTRIBUTION:

Out of the 50 patients, maximum number of cases were in the age group between 40-60 years as observed in the frequency distribution table. Maximum percentage (35%) of the cases were in the age group between 40-60 years. Similarly a prospective study conducted in Andhra Pradesh by Brundha G et al showed that 71% of the patients were in the age group between 30-50 years. Working age group peoples were mainly affected. Target age group people should undergo proper health education and personal protection in the working premises.

SEX DISTRIBUTION:

Out of the 50 patients included in the study, 30 (65%) of the patients were found to be male, 20 (40%) were females. There is gender predilection for males as compared to that of females. But the correlation between the sex and outcome was not stastically significant (p value >0.05). A study conducted in Andhra Pradesh showed male preponderance. Age and sex did not have any influence on the outcome.(P value >0.05)

OCCUPATION AND PLACE:

35 out of 50 patients were agricultural workers. 70% of the patients were from the agricultural sector and the remaining 30% of them were unskilled labourers and others. Maximum number of cases were from the rural area where agriculture is the sole occupation. Mortality was equally distributed among the agricultural and non- agricultural workers. It is stastistically insignificant. (P >0.05). Prevalence of Snake bite is common among the agricultural workers. There is increased risk of snake bite among the farmers, plantation workers.

Out of 50 patients, 39 patients were from rural area and the remaining 11 were from urban area. 78% of the patients were from rural area. Similar retrospective study in Chandigarh by Sharma N et al found out that 82.4% of the cases were reported from the rural areas. Among these 61% of the bites occurred during the night time. In rural areas, access to health care providers is

minimal and the awareness about the preventive measures were also lacking in the individuals.

In our study, we highlighted the health education regarding the preventive measures and early access to health care providers will reduce the mortality among the individuals.

SITE OF BITE AND FIRST AID MEASURES:

In our study, 32 patients were bitten in the lower limb and 14 patients in the upper limb. This shows that most of the cases were bitten in the lower limb. This is not statistically significant. Snakes have the easy accessibility to bite the lower limbs than the upper limb. A study in West Bengal by Hati AK et al(3) showed that the 53% of bites were in the lower limb and that too in night time during sleep.

In our study, among the 50 patients, 22 (44%) patients were undergone local procedures in the form of cutting, ligature, sucking the wound. A similar retrospective study in Singapore done by Tan HH (51) for 5 years duration observed that 15% (8) of the victims used the tourniquet as the first procedure, 2%(1) of the person was treated by cutting the wound and 6%(3) of the persons were treated by sucking the wound. This is due to the false beliefs and traditional methods followed in our country. In our study, we highlighted the early treatment in the hospital and the health education to the people and eradicating the false beliefs reduces the mortality among the snake bite victims.

TIME DELAY IN REACHING THE HOSPITAL:

In our study, 21 patients were reached the hospital within 3 hours, 12 patients in the duration between 3-6 hours and 17 patients reached the hospital in the duration of about more than 6 hours. Among the 17 patients who reached the hospital late, 5 patients were dead. This shows that the time delay in seeking the hospital treatment increases the mortality among the victims. This is statistically significant.($p < 0.05$). Nigam et al reported that 14 persons were died due to the delay in reaching the hospital, they were admitted in the hospital after receiving some traditional treatment in the time duration of about > 6 hours. Thus there should be some standard protocol to be followed even in the primary health care centres to prevent the mortality among the individuals who seek late admission the hospital.

TYPE OF SNAKE:

In our study group, Cobra (n-24 cases) was the frequent cause of snake bite. Remaining 21 cases were bitten by krait and 11 cases by viper. But the type of snake bitten by the individual and the outcome has no correlation i.e, it is statistically insignificant with P value of about 0.614. Similar study done in Nepal by Sharma SK et al(22), observed that the most common bite is due to Cobra, they showed that 58% of the patients were bitten by the cobra.

CLINICAL FEATURES IN NEUROTOXIC SNAKE BITE:

In our study group, 100% of the patients were having ptosis as the commonest manifestation of neurotoxic bite. 94% (n-47) of the patients were having EOM restriction, 86% (n-43) of the patients were having neck muscle weakness, 74% (n-37) of the patients were having muscle weakness and 64% (n-32) of the patients were having respiratory failure. According to Nigam et al 85% of the patients were having ptosis, 43% of the patients having EOM restriction, 71% of the patients were having palatal palsy, 42% with respiratory failure,7% with muscle weakness.

Among them, 32 patients had respiratory failure in our study, all of them were put on mechanical ventilation. Respiratory failure affected the outcome of the individuals. 6 patients was on mechanical ventilation for more than 7 days and out of this 5 patients died. Association between the duration of mechanical ventilation and the outcome is statistically significant with

p value- 0.012.

Respiratory failure has significantly correlated with the outcome and the duration of MV and outcome is also significant. Thus the respiratory failure patients were to be closely observed to prevent the mortality.

VAP AND OUTCOME ANALYSIS:

Prolonged ventilatory support had increased risk for VAP (ventilator associated pneumonia). Out of the 32 patients on ventilator, 12 patients

developed VAP. In our study group, VAP were developed in the patients who were on ventilator for more than 4 days. Correlation between the VAP and outcome was statistically analysed using the Chi Square test, but the association is not statistically significant (p value>0.05)

AMOUNT OF ASV NEEDED:

In our study group, 15 cases were received 16 vials of ASV, 35 cases were received 23 vials of ASV. If the patient had come earlier to the hospital had better prognosis and the amount of ASV need for the treating the victim was also low. There should be some standard protocol for treating the patients, that should be strictly followed to reduce the mortality among the individuals. A study in West Bengal by Ghosh et el(55) proved that the protocol treatment showed a marked decrease of about 66% in the amount of ASV administration and with 24% reduction in mortality. ASV received in the early hours of bite with the correct dosage has high influence over the outcome of the individual and has significant reduction in mortality.

Out of 50 patients in our study group, 24 patients were responded to neostigmine, neostigmine responders were bitten by the cobra. This is because of the pre-synaptic action of neostigmine.

CONCLUSION

CONCLUSION

Following results were concluded from the study:

1.Majority of the victims were in the age group between 41-60 years.

2.Males were most commonly affected in our study

3.Most of the individuals were from the rural area

4. Most of them were agricultural workers, because snake bite is the occupational hazard among the farmers and plantation workers.

5. Cobra is the most common bite encountered in our study. These patients were responded to neostigmine

6. Number of deaths due to Cobra were comparatively high in our study, but it has no significant effect on outcome. Because cobra is the most poisonous among all snakes.

7. Lower limb was the most common site of bite in our study group.

8.Ptosis is the most common presentation in the victims, about 100% i.e, all the patients were having ptosis

9. Time delay in seeking the hospital premises had significant effect on the outcome of the individual, this has to be reduced by health education and better transport facilities in the rural areas.

10. Most of the victims needed about 23 vials of ASV

11.Respiratory failure significantly affects the outcome of the individual, is the most important risk factor for mortality

12. Duration of ventilator support has significant effect on the outcome of the individual.

13. Chance of getting Ventilator associated pneumonia is dependent on duration of ventilator support but it is not related to the outcome.

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BIBLIOGRAPHY

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ANNEXURES

"CLINICAL PROFILE AND OUTCOME OF PATIENTS WITH NEUROTOXIC SNAKE BITE"

PROFORMA

Name: Age/Sex:

Address: Occupation:

SYMPTOMS:

Double vision

Drooping of eyelids

Descending paralysis

Weakness of Neck flexors

Respiratory failure

SNAKE BITE:

Site of bite	
Time delay in reaching hospital	
Neostigmine responder/non responder	
Dosage of ASV needed	

PAST HISTORY:

COPD	
CVA	
CKD	
HYPOTYHROIDISM	
MYASTHENIA GRAVIS	
KNOWN C/O MUSCULAR DYSTROPHY	

PERSONAL HISTORY:

SMOKING

ALCOHOL

GENERAL EXAMINATION:

GCS	

VITAL SIGNS:

PR-

BP-

RR-

SYSTEMIC EXAMINATION:

CVS:

RS:

ABDOMEN:

CNS:

	RIGHT	**LEFT**
PUPILS: Size Light reflex		
EXTRAOCULAR MOVEMENTS: Adduction Abduction Elevation Depression Nystagmus/ ptosis		
NECK FLEXORS		

RESPIRATORY FAILURE: SBCT		
UPPER LIMB POWER:		
LOWER LIMB POWER**:**		

INVESTIGATIONS:

COMPLETE HEMOGRAM

RFT, LFT

SERUM ELECROLYTES

ECG

CXR PAVIEW

NEUROTOXIC MANIFESTATION- ASSESSMENT:

Time delay in reaching hospital	Neostigmine responder / nonresponder	Dosage of ASV needed	Respiratory failure	Outcome		Ventilatory support		
				Recovery	Death	✓	☒	If yes, No. of days on ventilatory support

INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE, CHENNAI-3

EC Reg No.ECR/270/Inst./TN/2013
Telephone No : 044 25305301
Fax : 044 25363970

CERTIFICATE OF APPROVAL

To
Dr. Sudha .M,
Post Graduate, MD (General Medicine)
Institute of Internal Medicine,
Madras Medical College,
Chennai – 600003.

Dear Dr. Sudha .M,

The Institutional Ethics Committee has considered your request and approved your study titled **"Clinical profile and outcome of Neurotoxic snake bite"** No. 31072014.

The following members of Ethics Committee were present in the meeting held on 01.07.2014 conducted at Madras Medical College, Chennai-3.

1.	Dr. C. Rajendran, M.D.	-- Chairperson
2.	Dr. R. Vimala, M.D., Dean, MMC, Ch-3.	-- Deputy Chair Person
3.	Prof. Kalaiselvi, MD., Vice-Principal, MMC, Ch-3	-- Member Secretary
4.	Prof. Nandhini, M.D. Inst. of Pharmacology, MMC, Ch-3.	-- Member
5.	Dr. G. Muralidharan, Director Incharge , Inst. of Surgery	-- Member
6.	Prof. Md Ali, MD., DM., Prof & HOD of MGE, MMC, Ch-3.	-- Member
7.	Prof. Ramadevi, Director i/c, Biochemistry, MMC,Ch-3.	-- Member
8.	Prof. Saraswathy, MD., Director, Pathology, MMC, Ch-3.	-- Member
9.	Prof. Tito, Director, i/c. Inst. of Internal Medicine, MMC	-- Member
10.	Thiru. Rameshkumar, Administrative Officer	-- Lay Person
11.	Thiru. S. Govindasamy, BABL, High Court, Chennai-1.	-- Lawyer
12.	Tmt. Arnold Saulina, MA MSW	-- Social Scientist

We approve the proposal to be conducted in its presented form.

Sd/Chairman & Other Members

The Institutional Ethics Committee expects to be informed about the progress of the study, and SAE occurring in the course of the study, any changes in the protocol and patients information / informed consent and asks to be provided a copy of the final report.

Member Secretary, Ethics Committee

MEMBER SECRETARY
INSTITUTIONAL ETHICS COMMITTEE
MADRAS MEDICAL COLLEGE
CHENNAI-600 003

INFORMATION SHEET

We are conducting a study on **"CLINICAL PROFILE AND OUTCOME OF PATIENTS WITH NEUROTOXIC SNAKE BITE"** among patients attending Rajiv Gandhi Government General Hospital, Chennai and for that your specimen may be valuable to us.

The purpose of this study is to assess the occurrence of respiratory paralysis in patients with neuro toxic snake bite with following factors: Age, Sex, site of bite, geographical location, time delay in reaching hospital, neostigmine responder and non responder,dosage of ASV needed, Need for Mechanical ventilation and final Outcome on follow up.

We are selecting certain cases and if you are found eligible, we may be using your blood samples to do certain tests which in any way do not affect your final report or management.

The privacy of the patients in the research will be maintained throughout the study. In the event of any publication or presentation resulting from the research, no personally identifiable information will be shared.

Taking part in this study is voluntary. You are free to decide whether to participate in this study or to withdraw at any time; your decision will not result in any loss of benefits to which you are otherwise entitled.

The results of the special study may be intimated to you at the end of the study period or during the study if anything is found abnormal which may aid in the management or treatment.

Signature of Investigator | Signature of Participant

Date :
Place :

ஆராய்ச்சி ஒப்புதல் கடிதம்

பாம்பு கடியினால் நரம்பு மண்டலத்தில் ஏற்படும் பாதிப்புகள், காரணிகள் மற்றும் விளைவுகள் குறித்த ஆராய்ச்சி.

பெயர்	:	தேதி	:
வயது	:	உள் நோயாளி எண்	:
பால்	:	ஆராய்ச்சி சேர்க்கை எண்	:

இந்த ஆராய்ச்சின் விவரங்களும் அதன் நோக்கங்களும் முழுமையாக எனக்கு தெளிவாக விளக்கப்பட்டது. எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்துகொண்டு எனது சம்மதத்தை தெரிவிக்கிறேன்.

பாம்பு கடியினால் நரம்பு மண்டலத்தில் ஏற்படும் பாதிப்புகள், காரணிகள் மற்றும் விளைவுகள் குறித்தும் அதனைக் கண்டறிய மேற்கொள்ளப்படும் பரிசோதனைகளைப் பற்றியும் ஆராய்ச்சியாளர் கூற முழுவதும் விளங்கப்பெற்றேன்.

மேற்கொண்ட பரிசோதனையின் போது ஏற்படக்கூடிய பின்விளைவுகளையும் முழுவதும் உணர்ந்து இந்த பரிசோதனைக்கு மனமார சம்மதிக்கிறேன்.

ஆராய்ச்சியாளர் கையொப்பம் **பங்கேற்பாளர் கையொப்பம்**

நாள் :
இடம் :

MASTER CHART

“CLINICAL PROFILE AND OUTCOME OF PATIENTS WITH NEUROTOXIC SNAKE BITE”

MASTER CHART (PART-I)

S.NO	AGE	SEX	SITE OF BITE	NO.OF BITE	PLACE	OCCUPATION	SNAKE TYPE	TIME DELAY (HRS)	LOCAL PROCEDURE	LOCAL ENVENOMATION	WBCT	AMOUNT OF ASV GIVEN	NEOSTIGMINE RESPONDER / NONRESPONDER
1	60	M	L FOOT	SINGLE	RURAL	AGRI	COBRA	6	YES	YES	<20 MIN	16	YES
2	34	M	L HAND	SINGLE	RURAL	AGRI	VIPER	7	YES	YES	>20 MIN	16	NO
3	34	F	R FOOT	SINGLE	RURAL	NON-AGRI	KRAIT	2	NO	NO	<20 MIN	23	NO
4	52	M	L THUMB	SINGLE	URBAN	NON-AGRI	KRAIT	1	NO	NO	<20 MIN	16	NO
5	35	F	R FOOT	SINGLE	RURAL	AGRI	COBRA	8	YES	YES	<20 MIN	23	YES
6	55	M	R THUMB	SINGLE	RURAL	AGRI	VIPER	10	YES	YES	>20 MIN	23	NO
7	45	M	RGREAT TOE	SINGLE	RURAL	AGRI	COBRA	6 1/2	YES	YES	<20 MIN	23	YES
8	28	M	L ARM	SINGLE	RURAL	AGRI	COBRA	12	YES	YES	<20 MIN	23	YES
9	22	F	L FACE	SINGLE	RURAL	AGRI	COBRA	1/2.	NO	YES	<20 MIN	16	YES
10	25	M	L CHEEK	SINGLE	RURAL	AGRI	COBRA	13	YES	YES	<20 MIN	23	YES
11	30	M	L FOREARM	SINGLE	URBAN	NON-AGRI	VIPER	3	NO	YES	>20 MIN	16	NO
12	40	F	L FOOT	SINGLE	RURAL	AGRI	KRAIT	7	YES	NO	<20 MIN	23	NO
13	32	F	R FOREARM	SINGLE	URBAN	NON-AGRI	KRAIT	10	YES	NO	<20 MIN	23	NO
14	30	F	R ARM	SINGLE	RURAL	AGRI	COBRA	2	NO	YES	<20 MIN	16	YES
15	31	M	R LEG	SINGLE	RURAL	NON-AGRI	KRAIT	6	NO	NO	<20 MIN	16	NO
16	60	M	L THIGH	SINGLE	URBAN	AGRI	COBRA	13	YES	YES	<20 MIN	23	YES
17	22	F	L FACE	MULTIPLE	URBAN	AGRI	COBRA	14	YES	YES	<20 MIN	23	YES
18	32	M	L HAND	SINGLE	RURAL	NON-AGRI	KRAIT	4	NO	NO	<20 MIN	23	NO
19	28	M	L LITTLE	SINGLE	RURAL	AGRI	VIPER	6	NO	YES	>20 MIN	23	NO

			TOE										
20	25	M	R HAND	SINGLE	URBAN	NON-AGRI	KRAIT	1	NO	NO	<20 MIN	16	NO
21	24	M	R ARM	SINGLE	RURAL	AGRI	COBRA	6 1/2	NO	YES	<20 MIN	23	YES
22	17	F	L THIGH	SINGLE	URBAN	AGRI	COBRA	15	YES	YES	<20 MIN	23	YES
23	65	M	L 4TH FINGER	SINGLE	RURAL	AGRI	COBRA	12 1/2	YES	YES	<20 MIN	23	YES
24	48	F	R 2NDFINGER	SINGLE	RURAL	AGRI	COBRA	3	NO	YES	<20 MIN	16	YES
25	25	F	R3RD FINGER	SINGLE	RURAL	AGRI	VIPER	7 1/2	YES	YES	>20 MIN	23	NO
26	39	M	R FOOT	SINGLE	URBAN	NON-AGRI	KRAIT	4	NO	NO	<20 MIN	16	NO
27	38	M	R THIGH	SINGLE	RURAL	AGRI	KRAIT	3	NO	NO	<20 MIN	23	NO
28	75	F	R GREAT TOE	SINGLE	URBAN	AGRI	COBRA	10	YES	YES	<20 MIN	23	YES
29	45	M	R2NDFINGER	SINGLE	RURAL	AGRI	VIPER	3	NO	YES	>20 MIN	16	NO
30	25	F	L3RD FINGER	SINGLE	RURAL	NON-AGRI	COBRA	1/2.	NO	YES	<20 MIN	23	YES
31	19	M	R CHEEK	SINGLE	RURAL	AGRI	KRAIT	5	NO	NO	<20 MIN	23	NO
32	20	M	R FOREARM	MULTIPLE	RURAL	AGRI	COBRA	3	YES	YES	<20 MIN	23	YES
33	47	F	R THUMB	SINGLE	RURAL	NON-AGRI	VIPER	1 1/2	NO	YES	<20 MIN	16	NO
34	40	F	R LITTLE TOE	SINGLE	RURAL	AGRI	KRAIT	1/2.	NO	NO	<20 MIN	16	NO
35	37	F	R4THFINGER	SINGLE	RURAL	AGRI	COBRA	3	YES	YES	<20 MIN	23	YES
36	50	M	R HAND	SINGLE	RURAL	NON-AGRI	VIPER	2	NO	YES	>20 MIN	23	NO
37	63	M	R FOOT	SINGLE	RURAL	NON-AGRI	COBRA	3	NO	YES	<20 MIN	23	YES
38	52	M	L THUMB	SINGLE	RURAL	AGRI	KRAIT	4	NO	NO	<20 MIN	23	NO
39	55	M	R3RD FINGER	SINGLE	RURAL	AGRI	COBRA	1 1/2	NO	YES	<20 MIN	16	YES
40	36	M	L THUMB	SINGLE	RURAL	AGRI	COBRA	4	NO	YES	<20 MIN	23	YES
41	30	M	R2NDFINGER	SINGLE	RURAL	AGRI	COBRA	6	NO	YES	<20 MIN	23	YES
42	45	F	L LEG	SINGLE	URBAN	NON-AGRI	KRAIT	5	YES	NO	<20 MIN	23	NO
43	56	F	R4THFINGER	SINGLE	RURAL	AGRI	VIPER	2	NO	YES	>20 MIN	23	NO
44	76	M	R2NDFINGER	SINGLE	RURAL	AGRI	VIPER	10	YES	YES	>20 MIN	23	NO
45	61	F	R THUMB	MULTIPLE	RURAL	AGRI	COBRA	3	NO	YES	<20 MIN	23	YES

46	47	M	R LITTLE TOE	SINGLE	RURAL	NON-AGRI	KRAIT	6	YES	NO	<20 MIN	23	NO
47	56	F	R LEG	SINGLE	RURAL	AGRI	KRAIT	2	YES	NO	<20 MIN	16	NO
48	52	M	R ARM	SINGLE	RURAL	AGRI	COBRA	7 1/2	YES	YES	<20 MIN	23	YES
49	55	M	L THIGH	SINGLE	URBAN	NON-AGRI	COBRA	3	NO	YES	<20 MIN	23	YES
50	36	F	L FOREARM	SINGLE	RURAL	AGRI	VIPER	4	NO	YES	>20 MIN	23	NO

“CLINICAL PROFILE AND OUTCOME OF PATIENTS WITH NEUROTOXIC SNAKE BITE”

MASTER CHART (PART-II)

S.NO.	PTOSIS	EOM	NECK MUSCLE WEAKNESS	GAG	MUSCLE WEAKNESS	RESPIRATORY FAILURE	VENTILATORY SUPPORT	NO.OF DAYS IN MV	VAP	K+ LEVEL	DURATION OF STAY	OUTCOME
1	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	2	NO	4.5	4	RECOVERED
2	YES	RESTRICTED	YES	PRESENT	NO	NO	NO	NIL	NO	4	2	RECOVERED
3	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	2	YES	4.6	7	RECOVERED
4	YES	RESTRICTED	NO	PRESENT	NO	NO	NO	NIL	NO	4	3	RECOVERED
5	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	5	YES	4.3	6	RECOVERED
6	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	7	YES	4.2	7	DEATH
7	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	3	NO	4.7	5	RECOVERED
8	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	6NIL	YES	4	6	RECOVERED
9	YES	FULL	NO	PRESENT	NO	NO	NO	10	YES	4.5	3	DEATH
10	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	NIL	NO	5	10	RECOVERED
11	YES	FULL	YES	ABSENT	YES	NO	NO	NIL	NO	4.6	4	RECOVERED
12	YES	RESTRICTED	YES	PRESENT	YES	YES	YES	3	NO	4.3	6	RECOVERED
13	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	3	NO	4.3	3	RECOVERED
14	YES	FULL	NO	PRESENT	NO	NO	NO	NIL	NO	4.2	4	RECOVERED
15	YES	RESTRICTED	YES	PRESENT	NO	NO	NO	NIL	NO	4.1	4	RECOVERED
16	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	6	YES	4	6	DEATH
17	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	6	NO	4.3	8	RECOVERED
18	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	2	NO	4.2	5	RECOVERED
19	YES	RESTRICTED	YES	PRESENT	NO	NO	NO	NIL	NO	4.8	3	RECOVERED
20	YES	RESTRICTED	YES	PRESENT	NO	NO	NO	NIL	NO	4.7	3	RECOVERED
21	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	6	NO	4.5	8	RECOVERED
22	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	7	YES	3.6	7	RECOVERED
23	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	7	NO	4.2	8	RECOVERED
24	YES	RESTRICTED	NO	PRESENT	NO	NO	NO	NIL	NO	4.1	6	DEATH

25	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	4	NO	4	6	RECOVERED
26	YES	RESTRICTED	YES	ABSENT	YES	NO	NO	NIL	NO	4.3	4	RECOVERED
27	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	8	YES	4.2	8	DEATH
28	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	4	NO	4.5	4	RECOVERED
29	YES	RESTRICTED	YES	ABSENT	YES	NO	NO	NIL	NO	4.3	3	RECOVERED
30	YES	RESTRICTED	NO	PRESENT	NO	NO	NO	NIL	NO	4.2	5	RECOVERED
31	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	6	NO	4.5	6	RECOVERED
32	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	4	NO	4.6	4	RECOVERED
33	YES	RESTRICTED	YES	PRESENT	NO	NO	NO	NIL	NO	4.33	3	RECOVERED
34	YES	RESTRICTED	NO	PRESENT	NO	NO	NO	NIL	NO	4.9	5	RECOVERED
35	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	3	NO	5	7	RECOVERED
36	YES	RESTRICTED	YES	ABSENT	NO	NO	NO	NIL	NO	3.9	3	RECOVERED
37	YES	RESTRICTED	YES	ABSENT	YES	NO	NO	NIL	NO	4	4	RECOVERED
38	YES	RESTRICTED	YES	PRESENT	YES	YES	YES	2	NO	4.7	4	RECOVERED
39	YES	RESTRICTED	NO	ABSENT	NO	NO	NO	NIL	NO	4.3	3	RECOVERED
40	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	3	YES	4.8	6	RECOVERED
41	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	5	YES	4.1	7	RECOVERED
42	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	4	NO	4.9	4	RECOVERED
43	YES	RESTRICTED	YES	ABSENT	YES	NO	NO	NIL	NO	4.8	4	RECOVERED
44	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	7	YES	4.5	10	DEATH
45	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	2	NO	4.6	5	RECOVERED
46	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	3	NO	3.8	5	RECOVERED
47	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	2	NO	4	4	RECOVERED
48	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	10	YES	4.5	10	DEATH
49	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	4	NO	4.7	5	RECOVERED
50	YES	RESTRICTED	YES	ABSENT	YES	YES	YES	3	NO	4	4	RECOVERED

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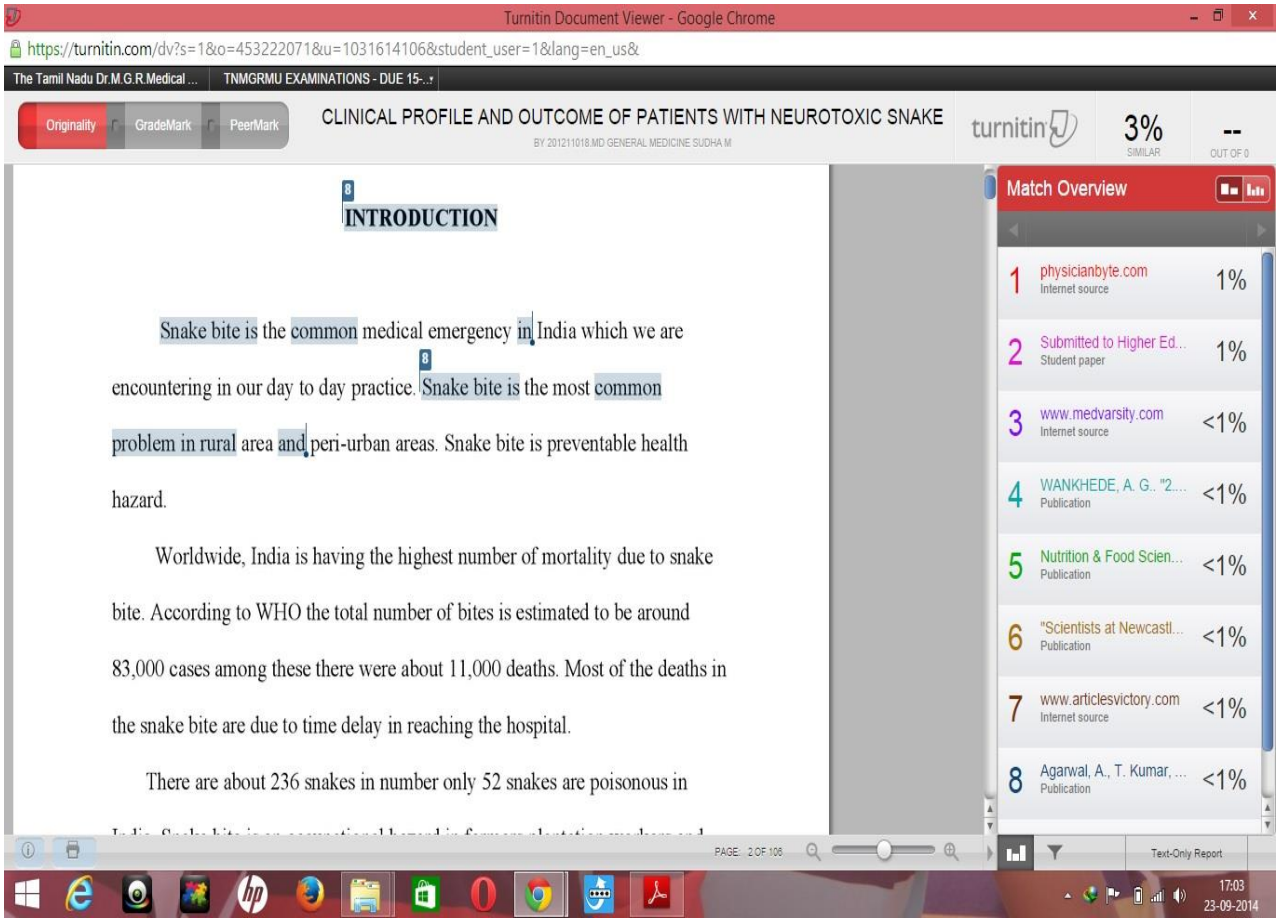
INTRODUCTION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INTRODUCTION
Snake bite is the common medical emergency in India which we are encountering in our day to day practice. Snake bite is the most common problem in rural area and peri-urban areas. Snake bite is preventable health hazard.
Worldwide, India is having the highest number of mortality due to snake bite. According to WHO the total number of bites is estimated to be around 83,000 cases among these there were about 11,000 deaths. Most of the deaths in the snake bite are due to time delay in reaching the hospital.
There are about 236 snakes in number only 52 snakes are poisonous in
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